FORESTRY ABSTRACTS

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CORRIGENDA TO FORESTRY ABSTRACTS

Previous corrigenda appeared with Vol. 13 (1), 16 (1) and 20 (1).

Vol. 2	p. 266 line 9	*delete*	Insect		
Vol. 4	p. 158 line 6 from foot	for	*continus*	read	*cotinus*
	p. 214 col. 2 line 12	*for*	influenza	*read*	influence
	p. 216 col. 2 line 27	for	*guinaese*	read	*guineense*
	p. 262 col. 2 line 23 from foot	*for*	4 (000)	*read*	4 (263)
Vol. 5	p. 34 col. 2 line 23	*for*	4 (320)	*read*	4 (230)
	p. 38 col. 1 line 31	for	*Pycnanthes*	read	*Pycnanthus*
	line 34	for	*Coniophera*	read	*Coniophora*
	p. 93 col. 2 line 7 from foot	*for*	Elder	*read*	Alder
	p. 110 col. 2 lines 14–15 from foot	for	*Juniperus virginiana*	read	*Thuja plicata*
	p. 133 col. 2 lines 20, 24	for	*Castilla*	read	*Castilloa*
	p. 135 col. 2 line 14 from foot	for	*Dalbergia sissoo*	read	*Shorea robusta*
	p. 144 col. 2 line 11	*for*	(1–354)	*read*	(101–354)
	p. 173 col. 1 lines 35, 36	for	*Myrtica*	read	*Myrica*
	p. 189 col. 1 line 37	for	*Pachyotes*	read	*Pachycotes*
	p. 200 col. 2 line 6 from foot	*for*	1904	*read*	1940
	p. 249 col. 1 line 26	for	*amigdalina*	read	*amygdalina*
		for	*stuarthiana*	read	*stuartiana*
	line 27	for	*goniocalix*	read	*goniocalyx*
Vol. 6	p. 191 col. 1 line 36	*for*	Kumason	*read*	Kumaon
Vol. 8	Index (authors)	*after*	Ellis, D. E. *for* 2714	*read*	2712
		add	Ferreira dos Santos, N. 60		
		delete	Santos, N. Ferreira dos 60		
	(species)	delete	*Picea orientalis* 2694		
		add to	*Platanus orientalis* 2694		
Vol. 9	p. 525 (No. 2618	*for*	GRANDCLEMEN	*read*	GRANDCLÉMENT
	Index (authors)	ditto			
	(subject) roots (damage to foundations)	*for*	2327	*read*	855
Vol. 13	p. 31 (No. 141)	*for*	SANTOS, N. FERREIRA DOS	*read*	FERREIRA DOS SANTOS, N.
	Index (authors)	*add*	Ferreira dos Santos, N. 141		
	p. 12	*for*	Jožanov	*read*	Kožanov
	under Oksa, E.	*for*	3057	*read*	3037
	(geogr.) *under* Tanganyika	*for*	3727	*read*	3527
Vol. 14	p. 27 (No. 164) } p. 264 (No. 2012) }	*for*	SANTOS, N. FERREIRA DOS	*read*	FERREIRA DOS SANTOS, N.
	p. 40 (No. 257)	*for*	BANAN, G. A.	*read*	BANĂN, Gh.
	p. 254 (No. 1912)	*for*	BLETCHLEY	*read*	BLETCHLY
	p. 265 (No. 2016)	*for*	BAZUKIS	*read*	BAKUZIS
	Index (authors)	*insert*	Bakuzis, E. V. *see* Hansen, H. L.		
		for	Banan, G. A.	*read*	Banăn, Gh.
		delete	Bazukis, E. V. *see* Hansen, H. L.		
		for	Bletchley	*read*	Bletchly
		insert	Ferreira dos Santos, N. 164, 2012		
		for	Hansen, H. L. and Bazukis, E. V.	*read*	Hansen, H. L. and Bakuzis, E. V.
		for	Ivonov, L. A.	*read*	Ivanov, L. A.
		for	Rodmeder, E.	*read*	Rohmeder, E.
		delete	Santos, N. Ferreira dos		

Vol. 15 Index (authors) *for* Milojkovči .. .. .. *read* Milojković

Vol. 16 p. 78 (No. 597) *for* SANTOS, N. FERRIERA DOS *read* FERREIRA DOS SANTOS, N.
p. 182 (No. 1514) *for* MIN .. .. .. *read* MINA
p. 516 (No. 4112) *for* 41, 1951 .. .. .. *read* 1, 1951
p. 538 (No. 4313) *for* 14 (No. 4537) .. .. *read* 14 (No. 3537)
Index (authors) *insert* Ferreira dos Santos, N. 597
for Min .. .. .. *read* Mina
delete Santos, N. Ferreira dos 597
for Stoffels, A. 2024 .. .. *read* Stoffels, A. 2023
(subject) *for* Combustion of wood 886–7 *read* Combustion of wood 885–6

Vol. 17 p. 283 (No. 2113) *for* 50% .. .. .. *read* 50°
p. 339 (No. 2455) *for* [Pol.pol.russ.e.] .. .. *read* [Pol.pol.russ.g.]
Index (subject) snow: storage and melting *for* 1581–6 .. .. .. *read* 1587, 1589

Vol. 18 p. 89 (No. 707) *for* No. 1372 .. .. .. *read* No. 1392
p. 207 (No. 1595) *ignore previous corrigendum and stet* wood-fired
p. 244 (No. 1923) for *N. taeda taeda* .. .. read *N. taedae taedae*
p. 268 (No. 2133) *for* clearance .. .. .. *read* cutting
for 50 min. .. .. .. *read* 50 mm.
p. 358 (No. 2909) *before* LE RAY, J. *insert* MUIZON, P. DE, and
p. 393 (No. 3224) *for* form height (vol./ha.) .. *read* form height (vol./b.a.)
p. 540 (No. 4450) *insert* *author's name* PLONSKI, W. L.
Index (authors) *for* Mazen-Papler .. .. *read* Mazen-Papier
insert Muizon, P. de and Le Ray, J. 2909
under Ohnesorge, B. *for* 3069.. .. .. .. *read* 3099
insert Plonski, W. L. 4450
under Vaartaja, O. *for* 3689.. .. .. .. *read* 368–9
(species) *L. tulipifera:* growth regulators, effects of *for* 1923.. .. .. .. *read* 1293
(subject) *under* Costs *for* establishment of plantations *read* logging
delete 2804
for 1425–7 .. .. *read* 4125–7
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p. 212 (No. 1751) *for* SKILLING, D. L. .. .. *read* SKILLING, D. D.
p. 232 (No. 1910) for *Acacia lockii* .. .. read *Acacia hockii*
p. 238 (No. 1955) *for* MARTIN, E. I. .. .. *read* MARTIN, E. J.
p. 238 (No. 1959) *first line of title* .. .. .. *read* ČUMAEVSKAJA, M. A. Bakterial'nyj rak
p. 330 (No. 2662) *for* titles .. .. .. *read* tables
p. 350 (No. 2859) *for* Kukuoka .. .. .. *read* Fukuoka
p. 504 (No. 3976) *for* GRÜNEBURG .. .. *read* GRÜNEBERG
p. 536 (No. 4264) *for* OSINENKO .. .. *read* OSIPENKO
Index (authors) David, R. *et al.* *add* 1357
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for Martin, E. I. .. .. *read* Martin, E. J.
delete Minin, A. N. 4902
delete Ngok, W. C. 1131
Pardé, J. *for* 2551 .. .. .. *read* 2552
Peel, J. D. *for* 2549 .. .. .. *read* 2550
add Wong, C. N. 1131
(species) after *Gilbertiodendron glandulosum* for *G. biloba* .. .. .. read *Ginkgo biloba*
(subject) Grain, spiral *add* 977, 2483–4
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Preservation of: bamboo *for* 3473.. .. .. .. *read* 3574
Selection system *for* 3019–23 .. .. .. *read* 4019–23
Spiral grain *add* 3396
(geogr.) Turkey: soils *for* 2699.. .. .. .. *read* 2629

Vol. 20 p. 21 (No. 101) *for* VETERENNIKOV .. .. *read* VERETENNIKOV
p. 65 (No. 486) *for* Hasser .. .. .. *read* Hausser
p. 74 (No. 558) *for* CHERNG-JIANN, S. .. *read* SHIUE, C.-J.
p. 109 (No. 870) *for* b.a.i. .. .. .. *read* b.a.
p. 143 (No. 1158) *for* No. 2463 .. .. .. *read* No. 2437
p. 187 (No. 1442) *for* inhibitor B .. .. .. *read* inhibitor β

Vol. 20	p. 268 (No. 2153)	for	*Carapa grandifolia* ..	read	*Carapa grandiflora*
	p. 299 (No. 2430)	*for*	Kämpfateg	*read*	Kämpfsteg
	p. 525 (No. 4271)	*for*	No. 1371	*read*	No. 1372
	p. 528 (No. 4297)	*for*	Nos. 2592–3	*read*	Nos. 3592–3
	p. 564 (No. 4578)	for	*Pentaclethra eetveldiana* ..	read	*Pentaclethra eetveldeana*
	p. 567 (No. 4597)	for	*Ophiostoma picea*	read	*Ophiostoma piceae*
	p. 597 (No. 4863)	for	*Copridosoma*	read	*Copidosoma*
	p. 603 (No. 4913)	for	*C.R. Acad. Sci. Paris* 249 ..	read	*C.R. Acad. Sci. Paris* 248
	p. 604 (No. 4921)	*for*	BEKANDER	*read*	LEKANDER
	p. 606 (No. 4937)	*after*	[cf. F. A.	*insert*	17
	(No. 4943)	for	*Ischurgops*	read	*Ischnurgops*
	p. 613 (No. 4997)	*for*	No. 2608	*read*	No. 3608
	p. 640 (No. 5245)	*for*	50 to 80° F.	*read*	5 to 80° F.
	p. 647 (No. 5302)	*for*	NGOK, W. C.	*read*	WONG, C. N.
	p. 662 line 5	for	*Promyšlennost*	read	*Hozjajstvo*
	line 12	for	*Thaumetopoeap ityocampa*	read	*Thaumetopoea pityocampa*
	Index (authors)	*delete*	Hasser, K. 486		
		add	Hausser, K. 486		

Vol. 21	p. 52 (No. 394)	*for*	20 No. 2705	*read*	19 No. 2705
	p. 96 (No. 773)	for	*Dendrosozer*	read	*Dendrosoter*
	p. 135 (No. 1102)	for	*Eccopterus*	read	*Eccoptopterus*
	p. 187 (No. 1401)	for	*Grandia*	read	*Granida*
	p. 195 (No. 1466)	*for*	RUDOLF, O. P.	*read*	RUDOLF, P. O.
		for	*ponderosa*	read	*resinosa*
	p. 201 (No. 1531)	*for*	BAZUKIS	*read*	BAKUZIS
	p. 219 (No. 1672)	*for*	Sacometti	*read*	Jacometti
	p. 255 (No. 1971)	for	*Dorylis*	read	*Doryalis*
	p. 259 (No. 2007)	for	*U. albo-atrum*	read	*V. albo-atrum*
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	p. 447 (No. 3413)	for	*Conwrentzia*	read	*Conwentzia*
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	p. 544 (No. 4053)	for	*Simpendorfer*	read	*Simpfendorfer*
	p. 554 (No. 4144)	*for*	edburgh	*read*	Jedburgh
	p. 615 (No. 4622)	for	*Chermes boemeri*	read	*Chermes boerneri*
	p. 616 (No. 4634)	for	*Pseudohyelinus*	read	*Pseudohylesinus*
	p. 625 (No. 4714)	*for*	Causes or gummosis ..	*read*	Causes of gummosis

FORESTRY ABSTRACTS

READERS' GUIDE SHEET

1.—New readers are reminded of the *Guide to the Use of Forestry Abstracts* which will enable them to get the maximum value from the Abstracts. *See inside back cover.*

2.—Terms appearing in the *Concise Oxford Dictionary* and Chambers's *Technical Dictionary* are ordinarily used in the text without explanation. The *British Commonwealth Forest Terminology* is followed for forestry terms.

3.—From Vol. 18 of the Abstracts up to THREE co-authors' names are cited in titles; if there are more than three, only the first, followed by *et al.*

4.—**Abbreviations.** The more common of those most likely to cause the reader difficulty are given below:—

(*a*) In title citations—

abstr.	= abstract	*n.d.*	= no date	*ser.*	= series
app.	= appendix(es)	*n.s.*	= new series	smry.	= summary
dgm(s).	= diagram(s)	ref(s).	= reference(s)	*suppl.*	= supplement
Extr. (from)	= extract	*repr.*	= reprint	tbl(s).	= table(s)
gph(s).	= graph(s)	rev.	= revised	transl.	= translation

From Vol. 18 also, any *italicized* language abbreviation(s) indicate matter in that language additional to any summary, e.g. [Jap.e.*e.*] where English captions to graphs, tables etc. exist.

(*b*) In text—

A.C.	= alternating current	gal.	= gallon(s)	p.a.i.	= periodic annual increment
b.a.	= basal area	H.F.	= high frequency	p.p.m.	= parts per million
bd. ft.	= board foot (feet)	H.ft.	= Hoppus feet	q.g.	= quarter girth
b.h.	= breast height	h.p.	= horse-power	R.F.	= radio frequency
b.p.	= boiling point	hr.	= hour(s)	rev./min.	= revolutions per minute
c.a.i.	= current annual increment	H.T.	= high tension	*s.l.*	= *sensu lato*
c.c.	= cubic centimetre	ht.	= height	sp.gr.	= specific gravity
c.i.f.	= cost, insurance, freight	KVA.	= kilovolt-ampere(s)	sq.	= square
conc.	= concentrated (solutions)	KWH.	= kilowatt-hour(s)	*s.s.*	= *sensu stricto*
cwt.	= hundredweight(s)	lb.	= pound(s) (weight)	std.	= standard(s) (timber measure)
d.b.h.	= diameter, breast height	m.a.i.	= mean annual increment	u.b.	= under bark
D.C.	= direct current	m.p.	= melting point	V.H.F.	= very high frequency
f.o.b.	= free on board	m.p.h.	= mile(s) per hour	viz.	= *videlicet*
g.b.h.	= girth, breast height	o.b.	= over bark	wt.	= weight
		oz.	= ounce(s)	yd.	= yard(s)
		p.a.	= per annum		

In abstracts relating to the U.S.S.R.—

'CNII lesosplava'	= Central Timber-floating Research Institute
CNIIFM	= Central Plywood and Furniture Research Institute
CNIIMÉ	= Central Research Institute for Mechanization and Electrification in Forest Exploitation
CNIIMOD	= Central Research Institute for the Mechanical Conversion of Wood
CNILHI	= Central Research Institute for Forest Chemistry
UkrNIIMOD	= Ukrainian Research Institute for the Mechanical Conversion of Wood
VIAM	= All-Union Research Institute for Aircraft Materials
VNIALMI	= All-Union Research Institute for Forestry in Agricultural Improvement
VNIILM (formerly VNIILH)	= All-Union Research Institute for Forestry and Forestry Mechanization

Also *F.A.* = Forestry Abstracts.

[P.T.O.

5. Local measures—

arroba (Brazil, Portugal) = 15 kg.
chain = 66 ft.
cho (Japan): 1·000 cho = 2·451 acres
donum (Cyprus) = 0·333 acre
dunam (Israel) = 0·247 acre
hold (Hungary) = 1·43 acres
koku (Japan): 1·000 koku = 9·827 cu. ft.
maund (India) = $82\frac{2}{7}$ lb.
morgen (S. Africa) = 2·116 acres
mu (China) = 0·152 acre = 0·061 ha.
oke (Greece) = 2·8 lb.
pikul (Malaya) = 100 katis = $133\frac{1}{3}$ lb.
rai (Thailand) = 0·40 acre
short ton = 2000 lb.
stremma (Greece) = 0·247 acre
tan (Japan): 1·000 tan = 0·245 acre
U.S. gallon = 0·84 English gal.

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FORESTRY ABSTRACTS

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NOTES ON PROGRESS IN FOREST SCIENCE

Just three years ago, in Vol. 19 (1) of *Forestry Abstracts*, there appeared under the above title the first part of a new kind of review, aiming to give the specialist some awareness of the progress being made in other branches of his science. That review was very favourably received throughout the Commonwealth. Several regions asked for the frankly impossible, e.g. its appearance annually, or its expansion to cover 'each separate main head of research', and some, losing sight of its principal object, urged exhaustive (detailed) treatment of certain heads—silviculture being specially mentioned; this, of course, is the province of our orthodox type of leader. Not a few regions were at pains to emphasize the interest and value of the innovation, not only to the research side, but to their field staff. All in all, there emerges a clear mandate to continue the feature and, following the original practice, we offer Part I, on 'Forestry Proper', below. It will be noted that certain important topics dealt with 3 years ago are taken up again, wherever the measure of progress seems to justify this. Specialists on the various subjects touched on have in all cases been consulted.

PART I: FORESTRY PROPER (INCLUDING DAMAGE TO TIMBER)

TREE PHYSIOLOGY

The pattern of sap flow. Progress has in many cases been linked with the development or refinement of research techniques. The injection of dyes into the lower stems of conifers by different methods of bole injection, showed that the dye ascended along tracheidal conduits that follow the grain of the sapwood and differ considerably between genera, and sometimes species. Experiments with 23 species belonging to 12 genera and 4 families revealed 5 basic patterns. Seen in cross-sections, they appeared as a right-hand spiral in *Abies*, *Larix*, *Picea*, and the subgenus *Diploxylon* of *Pinus*; a left-hand spiral in *Pinus monticola* and *P. lambertiana;* an increasingly zigzag pattern in *Sequoia*, *Libocedrus*, and *Juniperus*; a straight line—moving like the hand of a clock in successive cross-sections, indicating a sectorial winding ascent—in *Tsuga* and *Pseudotsuga*; and a straight line maintaining the same position in successive sections, in *Thuja* and *Chamaecyparis*. These findings lend support to the theory that a varying slope of grain is the rule rather than the exception in conifers, and that the sapwood accomplishes not only the transport but also the distribution of the transpiration stream [*F.A.* 21 Nos. 1421–3]. The spiral patterns for Pines were also found by two Rumanian scientists investigating moisture conditions in stems of *Pinus nigra* suffering from dieback [*F.A.* 19 No. 80].

In another study, tracers were used to follow the pattern of flow in a *Carya*, a *Carpinus* and a *Pinus* species. By appropriately placed cuts in the stem, the path could be made to move from one side of the stem to the other [*F.A.* 20 No. 4133].

The rate of sap flow. Russian experiments, using radio-active tracers to measure transpiration flow, showed considerable discrepancy in their results. In one study [*F.A.* 19 No. 78] with seedlings and trees $\geq$ 12 years old of many broadleaved species and one conifer (Scots Pine), the ascending stream under drought conditions was reported as reaching a rate of 18–25 m./min. and the descending stream (in the phloem) 32 m./min., the velocity of the ascending stream being directly related to changes in the moisture content of the site. In another experiment,however, involving some of the same species, in which the rate of flow was measured in seedlings whose roots had been immersed for 10–60 min. in a solution containing P^{32} or heavy water, the rate of flow varied between 0 and 8 cm./min., depending on species and degree of illumination. Rate of flow was also inversely related to leaf moisture content [*F.A.* 20 No. 2763].

In Danish studies on rate of sap flow and water consumption of broadleaved trees and conifers in connexion with various factors of soil and climate [*F.A.* 19 No. 79; 21 No. 1533], a modified form of Huber's heat-pulse method was used, in which short waves passing between electrodes strapped to a stem were used to heat the sap so that the time taken for a heat pulse to reach a point higher up the stem could be measured. Comparison with measurements of rate of flow by radio-active tracers, and of total water consumption, both performed on trees sawn off under water (in vessels specially constructed round the stem) and placed in pails of water without the cut surface being exposed to air,

showed that the heat-pulse method was highly sensitive and reliable, and that an almost linear relationship existed between water consumption and rate of flow on the one hand and heat-pulse velocity on the other, though at any given time the rate of sap flow varied considerably, even within one and the same growth ring, and was generally 3–4 times that of the heat pulse velocity—a finding on which further light has been thrown by investigations [*F.A.* 20 No. 1429] using equations based on the thermal conductivity of a complex, though homogeneous, system such as conifer xylem. When soil moisture was high, the Danish studies showed that water consumption depended primarily on humidity of the air and light intensity—a fact that could be demonstrated strikingly on the occasion of an almost complete solar eclipse—and to a lesser degree on wind and temperature. It decreased with decreasing soil moisture, Oak showing a greater reduction than Beech, especially on sandy soils. In an investigation on conifers, Silver Fir watered after a period of drought, raised its transpiration only slightly, but, when sawn off under water, increased it considerably. It is concluded that under conditions of maximum evaporation, the root system is not capable of supplying water fast enough, and that this fact makes for the Fir's greater drought susceptibility as compared with Spruce, in which transpiration under conditions of maximum evaporation is no less, but which reduces its transpiration more when soil moisture is deficient and responds at once to watering by increased transpiration.

Among 2-year-old seedlings investigated under various conditions, the highest root uptake rate of labelled P, viz. 170–180 cm./hr., was measured in *Ailanthus altissima*. Of the conifers included, *Metasequoia glyptostroboides* had the highest (120–130 cm.), and *Sequoia gigantea* the lowest, rate (10–15 cm.) [*F.A.* 20 No. 4134].

In a Rumanian study in a drought-affected stand of 55- to 60-year-old *Pinus nigra* [*F.A.* 19 No. 80], the rate of sap flow decreased with increasing dieback of the crown and almost ceased when $\frac{3}{4}$ of the crown was dead (only 6–90 cm./hr. vs. 50–136 cm. in healthy trees).

Evapo-transpiration. Studies of the evapo-transpiration from a whole stand [*F.A.* 21 No. 1368] showed satisfactory agreement between three methods used with a 10-year-old plantation of Scots Pine, viz. extrapolation of measurements from detached branches or foliage, combined with values for interception and soil surface evaporation; changes in soil moisture tensions, measured by tensiometers and electric-resistance blocks; and changes in soil water storage. Transpiration, whether measured as loss of water per unit of dry foliage, or as mm./day for the stand as a whole, fluctuated fairly closely with solar radiation and corresponded on the whole with Penman's estimate of potential evapotranspiration for grass. It exceeded the latter, however, from April to Sept. 1957 by 15%, and in the following, very wet, growing season by 36%, the differences being particularly marked when interception was high; the rate of evaporation of intercepted water greatly exceeded the transpiration rate. Transpiration was not appreciably less on a sub-plot protected from rain by a cover of roofing felt on the ground, the calculated soil water deficit reaching nearly 20 cm., than on a sub-plot maintained near field capacity by irrigation. Lysimeter research at San Dimas [*F.A.* 21 Nos. 1369–70] indicated that evaporation losses from a stand of *Pinus coulteri* were generally greater than from an evaporation pan, remaining constant in the early part of the drying season when those from the pan increased, but decreasing towards its end because of approaching moisture exhaustion. Evapotranspiration was considerably greater in the Pine lysimeter in a wet than in a dry year, but differed little in lysimeters with grass cover or left bare.

Miscellaneous uses of tracers. Tracers have also been used in the study of root systems of Douglas Fir [*F.A.* 20 No. 4276] and to label conifer pollen on the living tree by injecting radio-active substances into the stem [*F.A.* 18 No. 2602]; also to study the uptake of P^{32}, which was found to vary considerably over the seasons in a rhythm characteristic for each species. The maximum uptake for Oak and Birch took place in early June and coincided with the minimum uptake for Lime and Pine, which reached their maximum in July, when uptake by Oak and Beech had decreased sharply, suggesting that a suitable mixture would be less exacting on the P content of the soil than pure stands [*F.A.* 20 No. 1434]. The microflora of the soil, particularly *Pseudomonas* species, was found to compete with tree roots for labelled P and S, but to release them again, after death, in mineralized form [*F.A.* 21 No. 1942].

Gibberellic acid. The greater availability of gibberellic acid (g.a.) since World War II has stimulated research into its effect on forest species. Little or no growth response has generally been recorded in conifers [*F.A.* 20 Nos. 1752–3, 2781, 4146] but one investigator reported near-significant stimulation in height growth of *Pinus strobus* [*F.A.* 19 No. 378] and another an increase of 26–68% over controls in a period of 175 days in *Pinus virginiana* [*F.A.* 19 No. 2956], both using seedlings. Most trials have been carried out under natural photoperiods or under long days. A study in which the growth of *P. elliottii* was promoted under short-day conditions, the bud dormancy induced by such conditions being broken, whereas no response was observed under long-day conditions, suggests that in this

species the natural gibberellin factor becomes deficient only under a short-day regime [*F.A.* 20 No. 121]. Germination of non-stratified Douglas Fir seed was found to be accelerated both in light and in darkness but the response, in terms of radicle elongation, was greater in light, i.e. the inhibiting effect of light on root growth rate was more than overcome [*F.A.* 19 No. 2705; 21 No. 394]. Tube growth and cytological development were also significantly stimulated in the pollen [*F.A.* 20 No. 4182]. Weekly spraying of foliage with an aqueous solution of g.a. hastened leaf-fall in *Taxodium distichum* by 5–6 weeks—in striking contrast to effects on some broadleaved species (see next paragraph)—but had no after-effect on leaf flush in the following spring [*F.A.* 20 No. 2779; 21 No. 85].

In broadleaved species, on the other hand, height growth responses are consistently reported for a great number of species, e.g. Willows, Oaks, Tulip Tree, Maples, Sweetgum, *Eucalyptus rostrata* and some Indian species [*F.A.* 18 No. 1293; 19 No. 378; 20 Nos. 1753–4; 21 No. 86]. As a rule, the stronger solutions gave greater height growth, but frequently at the expense of vigour and root development. On cut branches, bud-break was stimulated in Beech and Lilac during the winter [*F.A.* 19 No. 2706], and pollen shedding accelerated in *Betula*, *Prunus* and *Acer* but not in *Populus* spp. [*F.A.* 20 No. 141]. The dormancy of seed of *Betula* spp. induced by darkness and low temperatures, could be broken by g.a. [*F.A.* 19 No. 2922]. An interaction of photoperiodism and g.a. was observed in Beech, Weigela and Camellia, where dormancy induced by natural or artificial short-day conditions was effectively broken [*F.A.* 20 Nos. 120, 2778, 2780]. High concentrations of g.a. caused flushing of hybrid Poplars in September, though the same doses had not stimulated growth during the preceding growing season [*F.A.* 20 No. 1440]. When leaves of selected branches of a number of deciduous species were sprayed in autumn with g.a. in aqueous solution, some species showed no response, while in others the onset of autumn coloration and leaf-fall was delayed, most spectacularly in *Fraxinus excelsior*, *Prunus avium* and *Acer pseudoplatanus*, whose treated leaves were still green on 21 Nov. when the rest of the trees were bare [*F.A.* 20 No. 2779]. In the following spring, delay in bud-break was noted in some species, *F. excelsior* and *A. pseudoplatanus* again reacting strongly. In *P. avium* the vegetative buds developed normally, but most flower buds remained dormant, and many had died. *Fagus sylvatica* showed prolonged dormancy in spring, but not delayed dormancy in the previous autumn [*F.A.* 21 No. 85].

In a study of the effect of growth substances on the cambium of disbudded shoots or young plants of *A. pseudoplatanus*, *F. excelsior* and *Populus nigra* var. *italica*, IAA produced a narrow zone of new xylem with lignified vessels, g.a. only small unlignified cells without vessels, but a combination of the two gave a wide zone of new wood approximating closely in structure to that of normal wood, suggesting that normal xylem development involves the presence and interaction of endogenous forms of both substances [*F.A.* 20 No. 122].

Gravimorphism. After experiments with fruit trees had shown that shoots trained horizontally flowered much more profusely than upright controls [*F.A.* 20 No. 127], the phenomenon of gravimorphism was studied in *Larix leptolepis*. When two- to five-year-old branches of 10- to 12-year-old trees, which had not yet flowered appreciably, were trained horizontally or in a downward-directed position, they produced many more flowers than in the natural position (50 and 90 respectively vs. 5·5 and 2 for two types of controls). The greater the angle from the vertical, the heavier the flowering. The trained shoots also showed markedly less extension growth [*F.A.* 20 Nos. 128, 263].

SYSTEMATIC BOTANY

The numerous papers and books on systematic botany abstracted during the last three years reflect the considerable amount of taxonomic research being done on a regional basis, covering much of the world's surface and especially the tropics. The A.E.T.F.A.T. Index [see *F.A.* 19 p. 4] alone, for 1956–57 [*F.A.* 19 No. 129; 20 No. 168] lists several thousand new names (new combinations, genera, species, subspecies and varieties) for Africa south of the Sahara and for Madagascar, and indicates the great progress being made in the preparation of many African floras.

Most of these strictly taxonomic articles are chiefly of interest to specialists, but two merit special notice. Chun and Kuang [*F.A.* 20 No. 175; 21 No. 153] fully describe and illustrate *Cathaya*, a remarkably distinct new genus of Pinaceae from China; in the same paper *Keteleeria loehri*, a fossil species from the Upper Pliocene of Germany is transferred to the new genus. The two important woody tribes Cynometreae and Amherstieae (Leguminosae) and their African genera have been redefined by Léonard [*F.A.* 20 No. 186], who based his conclusions on morphology, blastogeny (seedlings), wood anatomy and pollen characters and found good correlations between the four sets of characters.

A striking development in recent years has been the increased attention given by foresters to cytology, natural variation, tree breeding and selection, which has led to the discovery of many new facts of great significance in systematic botany. Some of the more interesting are mentioned below.

Chromosome numbers and morphology; breeding systems. A number of important woody groups have been reported on. Keen [*F.A.* 20 No. 159] found that *Taxus* agrees with most gymnosperm genera in having stable chromosome numbers. The eight species investigated have $x = 12$, with very minor differences between species in the number of chiasmata. But the Podocarpaceae, as shown by data given by Hair & Beuzenberg [*F.A.* 20 No. 158] for 52 species covering all genera of the family, are unusual among Gymnosperms in having a surprising variation in chromosome numbers ranging from $2n = 38$ to $2n = 18$. Among dicotyledons, a wide range of numbers are recorded for *Acacia* [*F.A.* 21 No. 2776], *Cassia* and *Casuarina*. For *Cassia* Irwin and Turner [*F.A.* 21 No. 4077] furnish evidence that the basic number is 7, the other numbers having been derived by aneuploid loss from various euploid levels. Their work does not support the elevation of section *Chamaecrista* to generic rank. Chromosome counts given by Barlow [*F.A.* 21 Nos. 2778–9] for 37 species of *Casuarina* conform with a suggested division of the genus into major groups. The extra-Australian species are probably ancient and are at the primary diploid level of the genus ($x = 8$ or 9). Higher chromosome numbers ($2n = 28$ to 20) occur in the Australian stocks and have probably arisen through polyploidy followed in some cases by stepwise reduction in number. In the *C. distyla* group, which includes 13 closely related species, sexual tetraploid forms have been recorded in nine species and apomictic triploids in four.

Natural variation; ecotypes. Habeck [F.A. 20 No. 150] has shown, by growing seedlings of *Thuja occidentalis* from upland and lowland habitats in three combinations of soil and moisture, that ecotypes exist in the wild populations of Wisconsin within a relatively small geographical area. Ecotypes of a very local nature have also been demonstrated in *Pinus monticola* by Squillace and Bingham [*F.A.* 19 No. 3844], who suggest that selection pressures operating on seedling establishment and growth rate prevent the infiltration of genes from sites which, though adjacent, are radically different in aspect, altitude and growing-season moisture. Owen [*F.A.* 19 No. 3848] has grown seedlings of Douglas Fir from various parts of its range under greenhouse conditions and found differences in physiology and development. Clinal variation in glaucousness in several Tasmanian species of *Eucalyptus* is described by Barber and Jackson [*F.A.* 19 No. 111]. The genes controlling glaucousness are lethal in sheltered lowland habitats, but essential to survival in exposed habitats at higher altitudes. An explanation is given of two methods attempting to measure the selective coefficients per generation on *E. urnigera*. Samples of *Ulmus carpinifolia* and *U. procera* from Cambridgeshire [*F.A.* 20 No. 1475] and from Hertfordshire [*F.A.* 21 No. 2774] were classified into biometrically defined groups by Richens, who also presents interesting evidence as to when the two species were introduced. For *Pinus sylvestris*, Carlisle [*F.A.* 20 No. 1486] deals with 144 scientific names used in the literature for its geographical and ecological variants.

Hybrids. Many papers deal with hybrids produced experimentally, or with putative hybrids and introgressants occurring in the wild or in plantations and arboreta. Many concern *Pinus* [*F.A.* 19 Nos. 104, 1390, 2726–7; 20 Nos. 148, 2813–4, 4179]. Wright [*F.A.* 21 No. 1477] describes the results of ten years' experimental work during which 36 different species combinations using several White Pines were attempted: 16 were successful, and in 6 (involving *P. ayacahuite*, *flexilis*, *griffithii* and *strobus*) the hybrid progeny grew faster than seedlings of either parent. Cytological studies made by Sax [*F.A.* 21 No. 4075] on F_1 hybrids involving *P. griffithii*, *P* × *holfordiana*, *P. parvifolia* and *P. strobus* (all White Pines) show that meiosis is mostly normal. The hybrids are vigorous and fertility relatively high. Although geographically separated for long periods, these Himalayan, Japanese and American species appear to be similar in chromosome constitution and genetic compatibility. For the Hard Pines belonging to the series *Sylvestres*, Wright and Gabriel [*F.A.* 20 No. 1461] attempted 55 species-crosses (including reciprocals and back-crosses); 23 yielded hybrids, and two-year-old seedlings of 8 of them were taller than non-hybrid seedlings of the same parents. *P. resinosa* (Red Pine) failed to cross with any other species. Incompatibility in several intra- and inter-sectional crosses was studied by McWilliam [*F.A.* 21 No. 118]. In five crosses (three of them with Red Pine as one of the parents) incompatibility seemed to be due to failure of the pollen tubes to function normally in the nucellar tissue of the other species, which differ in their amino-acid content.

Attempts to discover reliable characters for discrimination between certain hybrid Pines and their parents have met with varying success. Stomatal analysis was successful in most cases investigated by Mergen [*F.A.* 21 No. 119], but five cross-section characters of the needle used by Schütt and Hattemer [*F.A.* 21 No. 120] for the diagnosis of hybrids between *P. nigra* var. *austriaca* and *P. sylvestris* were found to be unsuitable. Bannister, Brewerton and McDonald [*F.A.* 21 No. 121], using vapour-phase chromatography, found a marked difference in the α-pinene and β-pinene proportions in *P. radiata* and *P. attenuata;* the F_1 hybrids, with one exception, were intermediate. They conclude that in population studies, analyses of the volatile fractions of the oleoresins would be useful.

Abstracts of papers dealing with hybrids in other genera can only be briefly noted: *Acacia* [*F.A.* 20 No. 1464], *Alnus* [*F.A.* 19 No. 3852; 20 No. 4187], *Betula* [*F.A.* 21 Nos. 123–4], *Eucalyptus* [*F.A.* 19 No. 1397], *Larix* [*F.A.* 20 No. 4169; 21 No. 115], *Picea* [*F.A.* 21 Nos. 1469, 2760], *Populus* [*F.A.* 19 Nos. 1399, 2735, 3891; 20 Nos. 1470, 1473; 21 Nos. 126, 1485], *Pseudotsuga* [*F.A.* 21 No. 1479], *Quercus* [*F.A.* 19 No. 3853; 20 No. 4188].

Nomenclature. Details of the internationally accepted procedure for the registration and naming of the many new variants or 'cultivars' being produced for use in forestry, whether by selection or by hybridization, are given in the *International code of nomenclature for cultivated plants* [*F.A.* 20 No. 166].

SILVICULTURE

In a subject geared largely to individual species, it is somewhat difficult to select salient items. A series on the silvical characters of American trees has been initiated by the U.S. Forest Service. In the period under review no fewer than 78 species have been covered in short monographs. Studies of exotic tree species introduced into the various parts of the Commonwealth were presented to the 7th British Commonwealth Forestry Conference in Australia and New Zealand (1957) and constitute an invaluable collection of experience [*F.A.* 18 No. 3906; 19 Nos. 264, 280, 285–91, 293, 299–303, 1602–5, 1608–10, 1612–15, 2889–90; 20 No. 1693]. Another important compilation is 'Tropical Silviculture', published by FAO [*F.A.* 21 No. 1619]. Vol. I sums up the status of tropical silviculture with particular reference to natural regeneration, on the basis of discussions at the 4th World Forestry Conference and a review of the literature; Vols. II and III reproduce the relevant papers read at the Conference.

Various countries have published or revised accounts of their nursery practice, including Denmark [*F.A.* 20 No. 4444], Finland [*F.A.* 20 No. 412; 21 No. 4311], Switzerland [*F.A.* 19 No. 4093], and the United Kingdom [*F.A.* 20 No. 314].

Uses of plastic materials. Among the technical improvements affecting nursery operations, polythene and other plastic materials have come into prominence. Polythene has been successfully adopted for planting-tubes in many countries and for many species, e.g. in Canada for the rapid growing of planting stock under glass [*F.A.* 21 No. 1731], for Eucalypts in Uganda [*F.A.* 21 No. 437], for *Casuarina equisetifolia* in sand-dune afforestation in the Cape Verde peninsula [*F.A.* 20 No. 3142], and for various species in Northern Rhodesia and Nyasaland [*F.A.* 21 No. 4341]. Other types of polythene container are being successfully used in Fiji and British Honduras for raising *Pinus caribaea* [*F.A.* 21 No. 4341], and polythene bags in Nyasaland [*F.A.* 19 No. 262] and Israel [*F.A.* 20 No. 443] for Eucalypts. Containers of allied materials, both serviceable and cheap, include 'Fitocella' for the raising, transplanting and carriage of Eucalypts in Italy, with growth results better than for earthenware pots [*F.A.* 19 No. 4132; 20 No. 3112], Alkathene—found much cheaper than bamboo baskets—in India [*F.A.* 20 No. 4484], and, cheapest of all, discarded milk cartons, made of a polythene-lined, greaseproof material, for Eucalypts in Uganda and Venezuela [*F.A.* 21 Nos. 437, 4342]. The polythene bag has also found successful use as a 'pre-germinator' in E. Africa; seeds mixed with vermiculite in a 1/2 ratio and a further proportion of water were hung in closed polythene bags at 60–70° F. and the seed, as it germinated, pricked out at transplant spacing, saving much time, space and labour [*F.A.* 20 No. 4456]. Parallel uses in stratification are reported from the U.S.A., where storing moistened Pine seed in polythene bags proved an efficient alternative to stratification in sand [*F.A.* 21 No. 390] and cheaper and more flexible than stratification in cotton bags with sphagnum moss [*F.A.* 21 No. 4299].

In storing and handling planting stock, polythene is proving no less valuable [*F.A.* 19 No. 342]. Corsican Pine, a species normally very difficult to handle, could be planted out without increased losses after 56 hours' storage [*F.A.* 20 No. 414]. Single seedlings could be stored up to 5 years (retarded in growth but healthy) with their roots rolled in oiled paper and the whole plants wrapped in 2-in. polythene tubes and watered [*F.A.* 20 No. 453]. In the United Kingdom, plants were stored successfully for periods from 2 weeks to 6 months according to species and condition, Spruce standing up best to prolonged storage, and transplants better than seedlings [*F.A.* 20 No. 4445]. Cognate applications of polythene have been made in bark grafting [*F.A.* 19 No. 1680], summer field-grafting [*F.A.* 20 No. 4482], air layering [*F.A.* 20 No. 3107; 21 No. 430]. It has also been used successfully in tree surgery to enable extensive bark wounds to heal [*F.A.* 19 No. 4209].

Following horticultural practice [*F.A.* 19 No. 358], black polythene sheeting is being increasingly used in forest nurseries to suppress weeds and improve soil temperature. Perforated sheets laid over seedbeds stimulated height growth and did not impede irrigation [*F.A.* 20 No. 3096], while plain sheets between rows in transplant beds eliminated or greatly reduced weeding [*F.A.* 20 No. 3096, 4466].

A further use for plain sheets has been found in the U.S.A. in the fumigating of nursery beds with MeBr, either manually [*F.A.* 21 No. 1701] or by a machine that simultaneously injects the gas, lays down the

covering sheet and seals the edges of the sheet with a furrow-slice of soil; another machine picks up and re-rolls the sheets after use [*F.A.* 20 No. 3081; 21 No. 1702].

Chemical 'pruning'. Trials of some promise are reported from West Germany in the use of growth regulators for 'pruning' hardwoods. When 120 selected Oaks in a 50-year stand were sprayed with Tormona, a 2,4,5-T preparation, in May, all branches and epicormics within the spraying height had shed their leaves by July, and by autumn showed signs of dying. Three years later most of them had dropped off; a few new epicormics had formed. Analysis of stem sections 1–3 years later showed that darker protection wood had formed at the bases of the branches and epicormics that had been killed, and no signs of cambial injury or incipient decay as a result of the treatment were found. It is recommended that such treatment be applied to trees at least 30 years old and 12 m. or more in height, so that stems can be cleaned up to a height of 6 m. without injury or loss of increment. A concentration of 0·2% of Tormona 80 was found to be sufficient. Beech needed a concentration of 0·4% [*F.A.* 18 No. 4075]. With Black Poplar 2–7 years old and Tormona 100, concentrations of 1 and 2% applied in August caused the leaves to die within three days, and even 0·15% was generally lethal. The branches put out neither leaves nor shoots in the following spring, but symptoms of decay had developed from the tip downwards, due to heavy infection by *Dothichiza populea*, *Cytospora* spp. and other fungi; they could be easily severed from the stem. Here, too, a protective layer had formed at the base and neither discoloration nor decay had penetrated the stem [*F.A.* 19 No. 432].

Another substance, maleic hydrazide, has been found to keep freshly clipped hedges, shrubs etc. in trim without further pruning, if applied periodically. Limited tests indicate that it is compatible with some insecticides, e.g. DDT and low concentrations of malathion [*F.A.* 20 No. 515].

Aerial fertilizing. With the increased importance of fertilizing as a treatment for plantations and older stands, considerable interest has developed in aerial application, which may well constitute the only practicable method for rugged topography, soft ground, or very dense stands, and offers opportunities for large-scale operations. After mixed stands of conifers of high density in the U.S.A. had been fertilized from a small biplane with 200 lb./acre of KCl in granulated form, at a combined cost of $13/acre for fertilizer and application, and another stand, of 28-year *Pinus resinosa*, with NPK fertilizer in liquid form—both treatments giving excellent growth responses [*F.A.* 18 No. 1598 and p. 294], trials were initiated in Germany, Sweden and the United Kingdom between 1957 and 1959 [*F.A.* 20 No. 4541; 21 Nos. 3135, 4382]. The stands treated were all coniferous, and in all tests, light fixed-wing aircraft were used to distribute fertilizer in granulated form. Results indicate that, provided that there is an airstrip within reasonable distance (3 miles is given as the limit in the U.K. tests), this method can be used economically over a wide variety of conditions. In England, some difficulty with uniformity of spreading was experienced, but in the Swedish trials, in which 42,500 kg. of fertilizers were spread over 89 ha. in four flying days, the operation was thought to be not only more economic (Kr. 80/ha., excluding fertilizers, against an estimated Kr. 130/ha. by other methods) but also to achieve a more even distribution. In the English trials it was found that a considerable amount of the fertilizer, viz. granulated triple superphosphate, was lodged in the foliage, but no signs of injury were observed. Nor were any injuries noted in trials on *Pinus radiata* and *Pinus pinaster* plantations in Australia that were sprayed experimentally with very high concentrations of $ZnSO_4$ (20, 40 or 50% on a weight/volume basis), N as urea (50%), and/or P as H_3PO_4 at the rate of 3 gal./acre [*F.A.* 21 No. 1769].

FUNGI

Fomes annosus. Research concerning this fungus, the principal cause of butt rot in conifers over much of the world [cf. *F.A.* 19 p. 7–8] continues vigorously. In Danish studies, the infection rate in the interior of a 38-year stand of Norway Spruce—the progeny of a single 'snake' tree—reached 77%. It was heaviest and most frequent in the 8–16 cm. diameter class and in trees < 8 m. high. There was no difference in susceptibility between trees of normal habit and trees of 'snake' form [*F.A.* 19 No. 4408]; nor, in other studies [*F.A.* 20 No. 711], were such differences found between various provenances tested by inoculation. Among non-European species, *Tsuga heterophylla* has been found to be particularly susceptible to the fungus in the United Kingdom [*F.A.* 21 No. 1654]. From Asia, there are reports that *F. annosus* was the most important of a group of rot fungi attacking *Abies sachalinensis* in Tokyo University Forest [*F.A.* 19 Nos. 3153–5] and that in stands of *A. faxoniana* and *A. recurvata* in Szechwan, where 78·6% of the trees were damaged by rot fungi, *F. annosus* was responsible for ca. 20% of the affected trees [*F.A.* 21 No. 1993]. In the U.S.A. its attack has been studied on *Pinus resinosa* [*F.A.* 21 Nos. 3356, 4571], *Pinus taeda*, in which it killed many trees left after thinning [*F.A.* 21 No. 4572], and other Pines.

On the other hand, some of the butt rot hitherto attributed to *F. annosus* has recently been traced to *Armillaria mellea* [*F.A.* 20 Nos. 705, 4781], and the generic name *Trametes* (under which *F. annosus* was formerly classified) has been used in Denmark somewhat indiscriminately and confusingly for many kinds of butt rot [*F.A.* 21 No. 4568].

The effect of various treatments and establishment methods on the incidence of the disease has been further investigated. In a long-term fertilizer trial established in Denmark in 1904 for comparing various nutrients, including N in the form of leguminous crops, supplied to stands of Norway Spruce, the infection rates on the fertilized plots varied from 10·8 to 14·3% against 4·9% for controls [*F.A.* 20 No. 490]. In another Danish study on Spruce [*F.A.* 21 No. 4568] wider spacings appeared to reduce the incidence of infection. No difference was found in resistance to inoculation, in 40- to 60-year Spruce, between trees planted on soil prepared by deep ploughing or subsoiling or in planting holes [*F.A.* 20 No. 712]. In an E. German study of Pines grown on agricultural land, roots—after developing well at first and easily penetrating to a great depth—appeared to decay and die back in the pole stage, causing a severe check in growth and heavy mortality. At about 60 years of age the Pines regenerated their root systems and resumed rapid growth. *Fomes annosus* was found on all roots in the affected stands, and it is suggested that its virulence in these non-forest soils is due to the absence of antagonistic fungi and bacteria common in forest soils, and that recovery may be connected with a gradual colonization of the soil by these micro-organisms. The use of resistant pioneer species, e.g. Birch and Poplar, on such sites is recommended [*F.A.* 20 No. 3334]. Not all hardwoods, however, would be suitable for this role. In Holland, fruiting bodies of *F. annosus* were found on *Prunus serotina* that had colonized a site where 12-year-old Scots Pine had been killed by the fungus [*F.A.* 21 No. 3355]. In a survey of conditions in Poland, where the fungus does much damage on unsuitable soils and former agricultural land, the use of broadleaved pioneer crops and subsequent inoculation with forest soil are recommended—such measures as isolation ditches and the wide-scale creosoting of stumps advocated for the United Kingdom [cf. *F.A.* 21 No. 4569] being thought too expensive and ineffective [*F.A.* 21 No. 4570]. In an analysis of the microflora of the soil under Spruce in France, the number of fungi (particularly *Trichoderma* and *Penicillium* spp.) per gram of soil was found to average 0·6 million in a stand free from *F. annosus*, 0·26 in a stand slightly infected, and only 0·11 in a heavily infected stand—trends even more marked in the rhizosphere than in the soil as a whole [*F.A.* 21 No. 3354]. Antagonism of fungi and bacteria found on surface wounds (from deer barking or logging) in a German Spruce stand heavily infected with *F. annosus* is thought to account for the fact that no trace of the fungus was found in any wound [*F.A.* 21 No. 3353]. American investigations on its rate of spread in a *Pinus resinosa* stand found that some fruiting bodies, apparently unconnected with Pine roots, occurred at distances up to 17 ft. from the nearest dead tree and more than that from any stump—appearing to grow saprophytically on surface litter, bark fragments, twigs etc. [*F.A.* 21 No. 4571]. Furthermore, the capacity of spores to penetrate 20–40 cm. layers of soil or sand, mentioned in the previous leader [cf. *F.A.* 19 p. 8] must not be forgotten when assessing the danger to stands even where no stumps of recent thinnings exist as sources of infection, and studies in the United Kingdom have revealed how numerous and widespread the spores are in the air. Close to the sporophores, deposition rates in the forest exceeded 20 spores/100 sq. cm./hr. under relatively calm conditions, and rates of 1–5 spores/hr. were common in well ventilated plantations, and have been recorded outside the forest. Even in the Shetland Islands, 200 miles from the nearest source, spores could still be detected [*F.A.* 20 No. 709; 21 No. 632]. A recent general appraisal of the situation in Great Britain concludes that *F. annosus* is likely to establish itself throughout the conifer plantations unless effective counter-measures—including creosoting of stumps—are adopted [*F.A.* 21 No. 4569].

Studies on stump infection by various fungi, mainly *F. annosus* and its competitive colonizer *Peniophora gigantea*, continue [*F.A.* 20 No. 707; 21 No. 1992]. Tests have been made of a number of substances for treating stumps immediately after felling, with a view to encouraging growth of fungi capable of suppressing *F. annosus*. Among the most promising of such substances were polyborchlorate and NH_4 sulphamate applied as 20 and 40% aqueous solutions respectively [*F.A.* 20 No. 708].

Control by injection of a fungicide (e.g. $ZnCl_2$, NaF) has been tried in Poland on Pine, but though partially successful against other fungi, it proved ineffective against *F. annosus* [*F.A.* 20 No. 713]. A Russian paper discussing experiments in connexion with susceptibility in Pine, showed that healthy and diseased trees differed in certain physiological characters [*F.A.* 21 No. 1912]. Biological studies on the fungus include one demonstrating its capacity to break down tannins, gallic acid and phenols, which suggests that these substances have to be excluded as factors in disease resistance of the host [*F.A.* 19 No. 591], one on the metabolism of different strains—showing little difference between them [*F.A.* 19 No. 1941], and one on growth-substance requirements *in vitro* [*F.A.* 21 No. 634].

INSECTS

The role of climatic factors in the dispersal of insects and the initiation of outbreaks. Spruce budworm studies in Canada have shown that large segments of adult populations, often with unspent ♀'s predominating, can be transported by air currents over long distances and can create outbreaks when deposited in dense, mature conifer stands. In young, open, or mixed stands, however, populations will decline unless there are repeated invasions [*F.A.* 19 No. 691]. Analyses of outbreaks of major forest insect pests in N.E. Germany over a decade showed them to be related to continental-type and Atlantic-type periods of climate; the former promoted increases in insect populations, especially of the more southerly species, and the latter severely depressed them [*F.A.* 19 No. 4454].

Biological control. Apart from continuing large-scale Canadian projects [*F.A.* 20 No. 4850; 21 Nos. 3468, 3499, 3503–4] some interesting, if not spectacular, results have been obtained, notably in Europe, Africa and the U.S.A. In Germany increasing attention has been devoted to the study of the value of ants as a biological control factor, and to experiments in artificially establishing and protecting *Formica rufa* colonies in the forest [*F.A.* 19 Nos. 656–8, 4460–1; 20 No. 757]. Some success has been claimed for these in the reduction of *Neodiprion sertifer* [*F.A.* 19 No. 659], *Tortrix viridana* [*F.A.* 19 Nos. 660–2, 4458–9; 21 No. 3420], *Pristiphora abietina* [*F.A.* 20 No. 2113] and *Cacoecia* spp. [*F.A.* 21 No. 3420]; also, in Italy, in controlling *Thaumetopoea pinivora* [*F.A.* 19 No. 2016]. A note of caution, however, has been sounded by some German researchers, particularly with regard to the difficulties of maintaining healthy ant colonies in pure Spruce and Pine stands, the inconclusive nature of their total effect against most pests and their possible adverse side effects, e.g. on other parasite populations [*F.A.* 19 No. 2015]. Another researcher concludes that ants are valuable in preventing rather than controlling mass outbreaks [*F.A.* 19 No. 2086].

In Tanganyika an outbreak of *Icerya purchasi* on Black Wattle was effectively controlled by the release of a species of ladybird, *Rodolia cardinalis* [*F.A.* 19 No. 681].

The value of birds in pest control has also been investigated in Germany and the U.S.S.R. [*F.A.* 19 Nos. 664–8; 20 No. 2055; 21 Nos. 3422]. Some evidence for their value against *Tortrix viridana* was found in Germany [*F.A.* 21 No. 718] and against *Lymantria dispar* in Bulgaria [*F.A.* 21 No. 2056]. Results, however, are generally inconclusive. Researchers in Germany suggest that birds can only exert a marked controlling effect within a narrow range of insect population density (i.e. when the infestation is such as to cause ca. 50% defoliation) and that it remains an open question whether birds can prevent an outbreak, or control one where the insect population has previously been reduced by chemical means [*F.A.* 21 No. 4660].

The usefulness of shrews as a biological control factor is under investigation in Canada [*F.A.* 21 No. 3508–9], but a German review of the literature expresses doubt as to their value [*F.A.* 19 No. 670].

Good results have been obtained in the control of the Wattle bagworm (*Acanthopsyche junodi*) by spraying with aqueous suspensions of a virus [*F.A.* 19 Nos. 700, 2050; 20 No. 779]. There is evidence that different strains of this virus exist, to which bagworm populations vary in susceptibility [*F.A.* 19 Nos. 2050, 3214], and the detection, isolation and purification of these have been worked out [*F.A.* 21 No. 4662]. Field tests (under evaluation) have been made in spraying with low concentrations of the virus, in order to avoid complete kill and ensure its transmission to the progeny of the pest [*F.A.* 21 No. 4661]. The use of virus diseases as a control measure has also proved effective against *Neodiprion sertifer* in Indiana [*F.A.* 19 No. 4573] and against *Thaumetopoea pityocampa* in France [*F.A.* 20 No. 4901].

Control by manipulation of moisture and acidity. An interesting suggestion for the control of *Pristiphora abietina* has come from Germany. Since it was noted that the number of imagos emerging from cocoons was drastically reduced by watering and that the larvae prefer very acid soils for spinning their cocoons, artificial watering and an induced neutral reaction may offer a possible means of control [*F.A.* 19 No. 4576].

Chemical control. Experiments in California have shown that the toxicity of chemical deposits to barkbeetles varies with the shape and size of the microscopic crystals. The most toxic deposit was composed of broad plate-like crystals resulting from a spray concentration of 640 mg./sq. ft. of bark surface. A 1280-mg. spray crystallized into isolated clumps which proved less toxic than the evenly distributed, short needle-like crystals from a 320-mg. spray [*F.A.* 19 No. 4466].

Success against termites in the U.S.A. has been reported from the use of inert but sorptive dusts, with or without the addition of toxic insecticides. Such dusts adsorb or disrupt the lipoid protective (wax) layer covering the epicuticle. It is only necessary for the insect to crawl about on a thin film of the dust: death by desiccation follows a water loss of ca. 30% of the body weight and is more rapid with the better adsorptive dusts than with some insecticides. Certain water-soluble fluorides incorporated with the particles of dust, act as contact poisons after the wax has been adsorbed or disrupted, thereby

greatly increasing the effect of the dust at low humidities while having the advantage that the effect is further enhanced by increasing humidity. The order of efficacy of the four outstanding groups of dusts tested was: silica gels, aerogels or precipitates > montmorillonite clays = attapulgite clays > diatomites [*F.A.* 20 No. 5285–6].

Investigations by the Fire Research Board in the United Kingdom have demonstrated the increased fire hazard brought about by *in situ* treatment with anti-woodworm preparations. Tests with sound wood have shown that these hazards may persist for periods within the following limits for two inflammable solvents and an active contituent commonly used in woodworm preparations: white spirit 24–48, kerosene 96–168, and *o*-dichlorobenzene 48–72 hours. For infected wood, or where evaporation is retarded or heavier (e.g. pressure) treatments are used, longer drying periods must be allowed [*F.A.* 19 No. 1100].

Ambrosia beetles. Intensified study of this important group of timber pests continues, notably in North America and Africa, but only some aspects can be touched on here.

(*a*) *Taxonomy and morphology.* Wood has published an account of the Xyloterini (Scolytidae) in N. America [*F.A.* 19 No. 3798], Nunberg the first part (covering 64 species) of his revision of the genus *Xyleborus s.l.* [*F.A.* 21 No. 1400], and Schedl a study of new species and records from Malaya [*F.A.* 20 No. 810]. Francke-Grosmann made a study of the organs that secure overwintering of the ambrosia fungi and their transfer to the next generation in beetles of the genera *Trypodendron* (Xyloterini) and *Xyleborus*, *Xyleborinus*, *Xylosandrus*, *Anisandrus* and *Eccoptopterus* (Xyleborini). Differences and affinities in the fungi themselves were referred to the taxonomy of the beetles [*F.A.* 21 No. 1102].

(*b*) *Biology.* Detailed and ingenious laboratory tests, using adult *Trypodendron lineatum*, have thrown much light on the factors governing the host-finding process, showing that phototropic reactions dominate all others, but that flight exercise may remove this dominance and allow the beetles to react to chemical and contact stimuli and so begin to bore or burrow [*F.A.* 21 No. 778]. Careful observation of flight habits shows this species to be capable of continuous flights of several hours' duration, the capacity or inclination to fly differing in those seeking logs and those flying to hibernation sites. Response to a flight stimulus during adult life seems to be closely related to condition of indirect flight muscles, which go through a marked but temporary change in the brood-establishment period. The high proportion of old females in overwintering populations suggests that many carry out more than one attack per overwintering cycle [*F.A.* 20 No. 3503]. After overwintering, heavy attack flights may be expected when air temperature exceeds 60° C. when most of the snow has melted. Early warm periods may provoke simultaneous flights over a wide range of altitudes, but if warming is gradual or some snow cover persists, attack flights may be spread over several weeks [*F.A.* 20 No. 3504]. Studies by the West African Timber Borer Research Unit showed that some variation in populations of a given species on the wing occurred between the wet and dry season. The beetles are either crepuscular and entirely nocturnal, or fly at single limited periods during the day. Gallery patterns are generally peculiar to a species, and the depth of radial penetration is generally constant, the smaller species (mainly Scolytidae) penetrating significantly less deeply than the larger Platypodidae [*F.A.* 20 No. 4929]. Other studies, mainly in Canada, have concentrated on adult hibernation habits [*F.A.* 20 Nos. 3505, 4928] and have assessed hibernation mortality [*F.A.* 21 No. 779]; one worker has reported significant numbers of beetles overwintering in the outer bark of standing (live and dead) trees [*F.A.* 21 No. 3492].

Attacks on live hosts have been reported from Ghana (*Khaya ivorensis* seedlings [*F.A.* 20 No. 4930], mature *Triplochiton scleroxylon* [*F.A.* 21 No. 3494]), Argentina (*Populus* cultivars [*F.A.* 20 No. 812]), W. Germany (young *Quercus borealis* [*F.A.* 21 No. 3493]) and Canada (young *Acer saccharum* chiefly [*F.A.* 21 No. 2124]), but in most cases special predisposing causes were invoked.

Continued trials in many parts of the world have confirmed the exceptional value of BHC or γBHC, in various formulations, for both prevention and control [*F.A.* 19 Nos. 2456, 4945; 20 No. 5274; 21 Nos. 2485, 3801: all in the tropics. *F.A.* 19 No. 2458; 21 No. 5067: temperate zone]. A DDT/BHC mixture in heavy oil sprayed on Pine logs infested with *T. lineatum* in Poland completely killed the infestation and conferred immunity to second-generation attack.

Hylotrupes bajulus. With the continued spread of this destructive household pest, especially in Great Britain [*F.A.* 21 No. 2479] but with first reports also from Australia [*F.A.* 19 No. 1102] and Jersey [*F.A.* 20 No. 3863], investigations into its biology and especially the bionomics of its larvae, have been numerous. In West Germany, where a recent assessment of infestation suggests some improvement [*F.A.* 21 No. 5074], breeding studies carried out over a period of some 10 years showed that egg-laying was increased when fertilized females were exposed to ultra-violet rays (Osram ultra-vitalex lamps), that cold treatment was necessary to induce pupation, and that the mechanical stimulus of rough wood surfaces, rather than smell, seemed to be the determining factor for egg-laying [*F.A.* 20 No. 2510]. In other German studies concentrating on the development and behaviour of larvae under

ordinary household conditions, it was found that Spruce sapwood was more nourishing than Pine, that weight loss in larvae was often, but not always, associated with pupation, and that larvae took from $1\frac{3}{4}$ to more than 3 years to develop; the data also indicated that, out of an original population of 100 young larvae, each weighing 13–26 mg., not more than 16 would attain a weight of 400 mg., the others pupating at lower weights or dying, and their total consumption of wood would be ca. 4000 c.c. [*F.A.* 21 No. 2480]. Continued work in England on the relation of wood moisture content to larval development has shown that larvae introduced to Scots Pine sapwood conditioned to 10% moisture content at 25° C. do not develop, whereas in wood of ca. 27% moisture content and the same temperature, they grew in weight in 43 weeks to more than 400 mg. [*F.A.* 20 No. 1171]. From Denmark proposals have come for complex statistical designs for the simultaneous analysis of several larval growth factors [*F.A.* 19 No. 2452].

SURVEYING

Ground surveys. The Tellurometer [see *F.A.* 19 pp. 9–10] has been in use in Canada, and modifications have been developed to suit Canadian conditions [*F.A.* 20 No. 887]: (*a*) the fitting of small thermostatically controlled ovens to surround the measuring crystals and permit the instrument to be used at low temperatures (down to — 40° F.); and (*b*) separation of the radio antennae from the rest of the instrument, so that they can be fixed to a light portable mast connected by cable to the instrument, and so operate above tree-top level. Neither adaptation was necessary in S. Africa, where the instrument was evolved, but they are essential in Canada.

Surveys combining aerial and ground work. 'Stratification' of forest stands through interpretation of aerial photographs [see *F.A.* 19 p. 10] has been further developed; in Tasmania [*F.A.* 19 No. 832], where classification of regrowth areas by the height classes of residual old-growth trees was found to be a very effective means of separating site classes; and in Ceylon [*F.A.* 20 No. 5033], where the stratification obtained from aerial photographs of rain forest was found to have a close relationship to previously recognized ecological types. In Switzerland a study has been made of aerial photographs (none of them taken for forestry purposes, and only two stereoscopic) to assess the value of aerial photography under Swiss conditions (characterized by a prevalence of the irregular shelterwood system, great local variability of site, climate and treatment, numerous species, etc.) [*F.A.* 20 No. 3605]. The possibility of distinguishing between species varied with season, but was largely limited to conifers vs. broadleaved species. The progress of conversions by systems and by major composition (conifer/broadleaved), and the progress of final fellings etc. could be followed better than on the existing series of maps, and the general state of a stand could be judged from density, crown form etc., but not whether it was being actively regenerated, or needed thinning or tending.

The preparation of aerial volume tables continues, and a number of new relations have been derived in this connexion. A worker in the U.S.A. [*F.A.* 19 No. 2168] has presented equations, obtained by multiple regression, to express radial growth in inches at b.h. during the last 5 years, age at b.h., d.b.h. in inches, and merchantable volume in cu. ft. (none of which can be read directly from photographs) in terms of tree height in ft., crown diameter in ft., crown density %, and number of trees per plot (all of which can be read from photographs). The equation for merchantable volume allows of an actual estimate of volume/acre to an accuracy of 9·6 cu. ft. from 29 photo plots with a fiducial probability of 95%. In British Guiana [*F.A.* 20 No. 5032] a linear relation was established between crown diameter measured on aerial photographs (scale 1 : 10,000) and d.b.h. measured in the field. In Western Canada, height of mature conifers can usually be measured on good photographs to an accuracy of ± 5–10 ft., but the height of immature stands cannot be measured with such constant accuracy, largely owing to the much greater proportion of live crown. Variable correction factors have therefore been worked out, ranging from + 13 ft. for 20 ft. photo-measured height to 0 for 100 ft., for Douglas Fir and Western Hemlock [*F.A.* 21 No. 3584].

To be concluded.

ABSTRACT SECTION

☛ New readers are reminded of the *Guide to the use of Forestry Abstracts* which will enable them to get the maximum value from the *Abstracts*—see inside back cover. Brief extracts from this publication are reproduced on the *Readers Guide Sheet*, issued with No. 1 of each volume of *Forestry Abstracts*.

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS GENERAL

For general *regional* accounts see section 90

Translations

See Nos. 974, 1031, 1098, 1144–5, 1160.

0 (021). Handbooks. Textbooks

1. ALLEN, S. W., and SHARPE, G. W. **An introduction to American forestry**. McGraw-Hill Book Company, Inc., New York. 3rd ed. (rev.) 1960. pp. viii + 466. Many refs. Price 62*s*.

Nine chapters have been re-written, the remaining 12 have been revised and brought up to date, and ca. 115 new illustrations have been added. Changes in the field of private forestry, the use of aircraft and insecticides, and the application of other new findings in forestry and wood utilization are emphasized.

0 (048.1). Bibliographical Lists

See also Nos. 9, 179, 199, 210, 213, 232, 235, 241, 741, 957, 984, 1161, 1236.

2. PISARSKA, M. Bibliografia polskiego piśmiennictwa leśnego za lata 1950–1952. **[Polish forestry bibliography, 1950–52.]** *Prace Inst. Bad. Leśn.* No. 204, 1960. pp. 130. 2150 refs. [Pol.russ.e.g.]

[Cf. *F.A.* 13 No. 2712.] Contains 2150 references, classified according to the O.D.C., and author and subject indexes. A Polish translation of the principal heads and subheads of the O.D.C. is included.

3. VALK, H. [Compiler.] Metsanduslik kirjandus 1945–1958. **[[Estonian] literature on forestry, 1945–1958.]** Eesti NSV Teaduste Akadeemia, Tartu. 1960. pp. 127. Many refs. [Est.Russ.] Price *Roubles* 3.50.

Arranged chronologically, with author and subject indexes.

0 (05). Periodicals. Yearbooks. Directories

See also Nos. 135, 1291.

4. ***Trudy Laboratorii Lesovedenija.*** Izdatel'stvo Akademii Nauk SSSR, Moscow.

Replaces *Trud. Inst. Les.* Citation in *F.A.*: *Trud. Lab. Lesoved., Moskva.*

0 (084.3/.4). Maps. Atlases

See Nos. 226, 290.

0 - - 014. Classification

See No. 943.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

5. **The Australian environment**. Commonwealth Scientific and Industrial Research Organization, Melbourne. 3rd ed. (rev.) 1960. pp. 151 + 5 maps. Many refs. Price £1. 10*s*.

A summary of the history and present stage of development of the plant and animal industries and their environmental background, including chapters on geography, climate, soils, agricultural development, water and irrigation, vegetation, pasture, field crops, and livestock. The chapter on vegetation, prepared by *J. G. Wood*, describing the major forms, their species composition, structure etc., is supported by a vegetation map compiled by *R. J. Williams*.

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

111. The Atmosphere. Meteorology. Climate and Microclimate

111.1. Composition, Structure, Mechanics and Thermodynamics of the Atmosphere in General

See No. 89.

111.2. Radiation and Temperature

6. **[Light penetration through brush canopy.]** *Extr.* from *For. Res. Rep. Weyerhaeuser Co., Centralia, Wash. 1959*, 1960 ([5]).

In connexion with brush control studies, vials containing anthracene [cf. *F.A.* 21 Nos. 1315–6] were exposed at seedling height at regular intervals along transects through the study area. In a typical Alder stand, 9% of full light reached the floor. Defoliation by chemical spray from a helicopter increased this to 44% in a similar stand.

111.7. Humidity, Evaporation. Clouds etc. Precipitation

See Nos. 43, 312.

111.8. Climatology. Climate and Microclimate

See also Nos. 20, 303, 312, 314, 373, 375, 384, 424, 465, 484, 489, 538, 886.

7. NIKOLOVSKI, T. Izučuvanje na microtemperaturnite uslovi vo nekoi tipovi šumi. **[An investigation of micro-temperature conditions in some types of forest.]** *Godišn. Šum. Inst., Skopje* 3 (3), 1958 (3–39). 18 refs. [Maced.e.]

Presents graphs and tables showing mean daily temperatures at 7 a.m., 2 p.m. and 6 p.m. for a year and for each month in 9 Macedonian forest types in 4 regions. The types include: *Fagetum moesiacae, Quercetum sessiliflorae, Querceto-Carpinetum betuli, Carpinetum orientalis, Castanetum vescae, Quercetum cocciferae*. A general tendency was noted for extremes of temperature to be reduced as compared to those outside the forests. A comparison of

lengths of growing season showed that inside the *F. moesiacae* the period was 21 days longer, and inside the *Q. sessiliflora* 31 days longer, than outside. No such difference was found in those forest types that occur in the warm belt.

114. Soil. Soil Science

See also Nos. 292, 314, 489.

8. GJEMS, O., *et al.* Riktlinjer för insamling och bearbetning av jordprov från skogsmark. **[Recommendations for forest soil sampling.]** *K. Skogs- o. LantbrAkad. Tidskr., Stockh.* 99 (1/2), 1960 (97–104). 7 refs. [Sw.E.]

In two sections: (*A*) Field sampling; (*B*) Laboratory pretreatment of samples.

114.1. Soil Physics

See also Nos. 15, 28, 33, 58–61, 104, 241–4, 484, 520, 888–9, 909.

9. **Bibliography on physical properties of forest soils (1941–1958).** *Bibliogr. Bur. Soils, Harpenden* No. 185, 1959. pp. 26.

Comprises 134 references, with brief abstracts, arranged under the heads: soil moisture; air, porosity; structure and texture; and temperature.

10. TSUTSUMI, T. **[On the mutual relationships of the physical properties of forest soils. (I) Relationship between volume weight and porosity.]** *J. Jap. For. Soc.* 40 (2), 1958 (47–52). 3 refs. [Jap.jap.e.*e.*]

On the basis of > 700 determinations, presents equations expressing the porosity/volume-weight (P/VW) relationship, in which the position of a given soil depends on two factors: (*a*) its texture, and (*b*) its structure.

11. TSUTSUMI, T. **[On the mutual relationships between physical properties of forest soils (II). On the relationship between the humus content and the specific gravity of forest soils.]** *J. Jap. For. Soc.* 40 (6), 1958 (237–41). 12 refs. [Jap.jap.e.*e.*]

[See preceding abstr.] Presents a formula clarifying the relationship between the humus content and sp.gr. of the soils of the Sugi forest of Kito and the Hinoki forest of Owase.

12. DIRNBERGER, H. Die Bedeutung des Wasserhaushaltes im Waldbau, dargestellt am Beispiel von Waldtypen im nordwestlichen Waldviertel. **[The silvicultural importance of the water regime, illustrated on forest types of the N.W. 'Waldviertel'.]** *Cbl. ges. Forstw.* 77 (2), 1960, (92–114). 31 refs. [G.g.]

Presents, for an area of ca. 10,000 ha. on a granite plateau in N.W. Lower Austria, fairly homogeneous in soil texture (largely sand and gravel), climate and topography, data on soil density, pore volume and size, water capacity etc. in relation to forest types. These suggest that, under the influence of conifers (which are not native to the area), a degradation of soils can be traced leading from a natural, favourable herbaceous type via various intermediate types to a poor *Calluna/Vaccinium vitis-idaea* type.

13. BOROWIEC, S. Niektóre właściwości fizyczne gleb leśnych ze szczególnym uwzględnieniem pojemności wodnej. **[Some physical properties of forest soils with special reference to water-holding capacity.]** *Sylwan* 104 (3), 1960 (61–74). 25 refs. [Pol.russ.e.]

Tabulates data from 4 sites in Poland showing particularly the variation of maximum water-holding capacity with soil type and ground vegetation.

14. OBMIŃSKI, Z. Badania na wahaniami poziomu wód gruntowych w niektórych biotopach Białowieskiego Parku Narodowego. **[Studies on the water-table fluctuations in some biotopes of the Białowieża National Park.]** *Prace Inst. Bad. Leśn.* No. 201, 1960. pp. 162 + 1 dgm., 2 gphs. 29 refs. [Pol.russ.e.g.]

A detailed study, covering 1948–55, on 8 biotopes representative of the *Pinetum typicum, Piceeto-Pinetum, Querceto-Piceeto-Pinetum, Pseudo-quercetum, Pinetum turfosum, Carpinetum typicum, Querceto-Carpinetum,* and the *Fraxineto-Piceeto-Alnetum.* There is a 6-page summary in English.

114.2. Soil Chemistry

See also Nos. 11, 21–2, 25–32, 44, 241–4, 520, 528, 656–9, 662, 889.

15. ANDREEVA, E. A. Estestvennaja radioaktivnost' počv i opredelenie valovogo kalija radiometričeskim metodom. **[Natural radio-activity of soils, and determination of total K by the radiometric method.]** *Počvoved.* 1960 (5), (21–9). 16 refs. [Russ.e.] A.P.B.

[Cf. *F.A.* 21 No. 1329.] Tabulates data on the natural radioactivity of several sod-podzolic soils, a chernozem, a brown forest soil (Amur basin), a krasnozem and a serozem. Describes and gives results of a trial in determining total K in the soil by a radiometric method, comparing values with those given by chemical analysis.

16. DOBRICKAJA, JU. I. O soderžanii titana v počvah Jaroslavskoj oblasti. **[The titanium content of soils of the Yaroslavl region.]** *Počvoved.* 1960 (3), (95–103). 14 refs. [Russ.russ.e.] A.P.B.

Tabulates data on the Ti content of the various horizons under forest (several types, but mainly Spruce), arable land, and meadow.

17. KUZNETSOVA [KUZNECOVA], Z. D. **The group composition of particles smaller than 0.01 mm. in meadow chernozem and in grey forest soils of the Tomsk region.** *Izvestija Sibirskogo Otdelenija Akademii Nauk S.S.S.R., Moskva* 1960 (1), (114–9), [Russ.] From *abstr.* in *Chem. Abstr.* 54 (12), 1960 (12445). P.R.

The humus ranges from 11·66% (dry wt.) of the fine particles in the upper chernozem to 1·12% in the lower light-grey forest soils. Humus content is highly correlated with total N and total P contents.

18. BURLAKOVA, L. M. **The forms of phosphorus in the grey forest soils and the chernozem-meadow soils of the Tomsk region.** *Izvestija Sibirskogo Otdelenija Akademii Nauk S.S.S.R., Moskva* 1960 (1), (138–43). [Russ.] From *abstr.* in *Chem. Abstr.* 54 (12), 1960 (12445). P.R.

The P content varies seasonally, its rise in summer being closely correlated with NO_3-N in the soils examined, so that sudden changes in P are reflected in corresponding changes in nitrate. This suggests

that the N economy of the soil can be improved by the wider use of P fertilizers.

19. SOKOLOV, D. F. Sezonnye izmenenija v soderžanii gumusa i azota v malomoščnyh černozemah pod lesnymi nasaždenijami. [**Seasonal changes in the content of humus and N in shallow chernozems under forest stands.**] *Počvoved.* 1960 (6), (33–43). 25 refs. [Russ.russ.e.] A.P.B.

The investigations were made in the growing season of 1955 on 8 plots in Oak stands (of various ages, subjected to different silvicultural treatment, and with different species admixed) in the Derkul steppe. The greatest seasonal change in the content of humus and total N occurred in the top 10-cm. layer. In general, such seasonal changes were negligible in the top 30-cm. layer of soil in both forested and non-forested areas.

20. EHRHARDT, F. Stickstoffnachlieferung aus Waldhumus in verschiedenen Höhenlagen der Tiroler Alpen. [**Production of available N in forest humus at different altitudes in the Tyrolean Alps.**] *Abstr.* in *Berichte aus der land- und forstwirtschaftlichen Forschung, Bad Godesberg* 6, *Suppl.* No. 1, 1959 (15–6). [G.]

Spruce/*Vaccinium* raw humus from a forested slope in the Zillertal (maximum height difference 1500 m.) was stored in the field so that no N depletion by higher plants took place, and the seepage water was collected. Analyses of the humus and seepage water indicated that production of available N decreased with increasing altitude, from ca. 32 to 12 kg./ha./year, roughly in proportion to available warmth during the growing season. No N deficiency was found in Spruce on the highest plots, N contents of needles being greater than at lower altitudes, suggesting that the colder climate restricted C assimilation more than the production of available N, and hence that fertilizers would not help in raising the climatic timberline. Comparatively large amounts of available N accumulated during the winter frosts, thus promoting rapid development of vegetation immediately after the thaw. In late spring and summer, the N requirements of the rapidly multiplying soil micro-organisms reduced the amounts available to higher plants until the onset of colder weather. Drought periods may affect the seasonal trend. Some of the field results were confirmed by laboratory experiments.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 35–6, 38–9, 41, 44–5, 241–4, 276, 398, 656, 887, 890, 909.

21. KARPAČEVSKIJ, L. O. Mikromorfologičeskoe issledovanie processov vyščelačivanija i opodzolivanija počv pod lesom. [**Micro-morphological investigation of leaching and podzolization processes in soils under forest.**] *Počvoved.* 1960 (5), (43–52 + 1 plate). 22 refs. [Russ.russ.e.] A.P.B.

Studies these processes in: (1) sod medium-podzolic, medium clay-loam under Oak; (2) slightly soddy, medium-podzolic sandy loam under Lime/Oak/Pine; (3) slightly soddy, medium-podzolic clay-loam under the *Piceetum myrtillosum*; (4) peaty gley-podzolic sandy loam under the *P. hylocomiosum*; and (5) slightly leached chernozem under an Oak plantation. Colloid migration in these soils is described.

22. MCKENZIE, L. J., WHITESIDE, E. P., and ERICKSON, A. E. **Oxidation-reduction studies on the mechanism of B horizon formation in podzols.** *Proc. Soil Sci. Soc. Amer.* 24 (4), 1960 (300–5). 18 refs.

The studies were made *in situ* under the crown of a large Sugar Maple on a well drained sand, under the crown of a large Aspen on imperfectly drained sand, and under Hemlock/White Cedar/Alder on a poorly drained sand.

23. ŠUMAKOV, V. S. Principy klassifikacii, nomenklatury i kartirovanija lesnyh podstilok. [**Principles of classification, nomenclature and mapping of forest litter and humus layers.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (199–216). [Russ.]

24. MIKOLA, P. **Comparative experiment on decomposition rates of forest litter in southern and northern Finland.** *Oikos* 11 (1), 1960 (161–6). 8 refs. [E.e.]

A 3-year field experiment with Birch and Pine litter, using techniques previously developed [cf. *F.A.* 17 No. 1149], showed distinct differences in the rate of decomposition. The mean loss of organic matter from litters in South Finland (Vilppula and Ruotsinkylä) was 40% higher than in similar conditions in Lapland (Pallasjärvi). The rate of decomposition increased with increasing mean summer temperature.

25. LEVINA, V. I. Osobennosti obmena mineral'nyh ėlementov meždu mohovo-lišajnikovo-kustarničkovym pokrovom i počvoj v dvuh tipah sosnovyh lesov Kol'skogo poluostrova. [**Mineral-element exchange between the moss/lichen/shrub vegetation and the soil in two types of Pine forest in the Kola peninsula.**] *Počvoved.* 1960 (5), (30–42). 23 refs. [Russ.russ.e.] A.P.B.

Studies in the *Pinetum cladinosum* (*a*) and *P. hylocomiosum* (*b*) [see *F.A.* 21 No. 3952] showed that the moss/lichen/shrub layer in (*a*) had high contents of Si, P and S, and was low in Ca; in (*b*) it was rich in Mn, Ca, Al, P and S, and low in Si. In the decomposition of the plant remains, Ca, Mg, S, P, and Mn were easily leached, while Al, Fe and Si were more resistant to leaching and were accumulated. In the litter and humus layer, on an iron podzol under (*a*), there was an accumulation of 695 kg. of ash minerals per ha., while on a humus podzol under (*b*) the accumulation was 1627 kg./ha. Despite these differences, the general course of soil formation is the same on both types.

26. P'JAVČENKO, N. I. Biologičeskij krugovorot azota i zol'nyh veščestv v bolotnyh lesah. [**Biological cycle of N and ash elements in boggy forests.**] *Počvoved.* 1960 (6), (21–32). 21 refs. [Russ.russ.e.] A.P.B.

In boggy Spruce forests (*Piceeta uliginoso-herbosa*) aged 100–200 years, the c.a.i. (volume) of the trees is less than the annual volume increment of the

herbaceous and mossy vegetation; in this increment of the ground vegetation, the contents of N and ash are three times, of Ca and K four, and of Mg six times that in the wood increment. In a boggy Pine forest (*Pinetum sphagnosum*) aged 120 years, c.a.i. (volume) of wood is $\frac{1}{16}$ of the annual volume increment of the sphagnum moss layer. In the Spruce forests ca. 84% of the N, and 78–90% of the ash elements are returned annually to the soil in the litter. In the Pine forest, more N and Si are returned to the soil than are taken up by the vegetation; ca. 50% of the K and Mg is so returned, and 73–95% of the remaining elements. The accumulation in the sphagnum peat of N and ash elements (except Mg and K) is explained by root exudates, fixation of atmospheric N by micro-organisms, the decomposition of organic matter, and the settling of airborne dust.

27. Šumakov, V. S. Azotnyj režim počvy v dvuh tipah sosnovogo lesa. [**Soil N regime in two types of Scots Pine forest.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (161–70). [Russ.]

Compares the N regime in (1) the *Pinetum vacciniosum*, and (2) the *P. tiliosum*. It is concluded that the quantity of N in litter arriving annually at the soil surface in (2) is double that in (1) but, owing to relative enrichment in total N during decomposition, total N in the litter-and-humus layers of (1) is almost double that of (2). Ammonification predominates in the soil and surface organic layers of (1), and nitrification in those of (2).

28. Vlijanie hvojnyh i listvennyh nasaždenij na vyščeločennye černozemy lesostepi. [**Effect of coniferous and broadleaved stands on leached chernozems of the forest-steppe zone.**] *Trud. Lab. Lesoved., Moskva* No. 1, 1960. pp. 201. Many refs. [Russ.]

Five papers, all dealing with investigations in the Mokhovoe forest district, Orel region, mainly in Pine, Spruce, Larch, Birch and Oak stands as follows: Circulation of mineral substances and changes in the physical and chemical properties of leached chernozems under coniferous and broadleaved stands (*I. M. Rozanova*) [concludes that Larch and Spruce should be planted on a larger scale in the area]; Processes in the conversion of organic matter of coniferous and broadleaved woody species, and their influence on the composition of the humus in leached chernozem [cf. *F.A.* 21 Nos. 17, 3957] (*S. V. Zonn* and *D. F. Sokolov*) [concludes that species such as Siberian Larch, Norway Spruce and Scots Pine improve rather than impair the condition of the soil]; Influence of forest stands of different composition on microbiological processes in leached chernozem (*E. V. Runov* and *I. E. Mišustina*); Rate of CO_2 formation, and its distribution in the soil air in leached chernozems in relation to the composition of the forest vegetation (*V. N. Mina*) [respiratory activity, CO_2 concentrations, and changes in concentration with time and depth were greater under Birch and Oak than under Spruce and Pine; Larch was intermediate]; Influence of conifers and broadleaved species on the physical properties and moisture regime of leached chernozems (*S. V. Zonn* and *E. A. Juz'mina*) [detailed findings do not confirm the generally held opinion that forest stands on these soils assist the downward movement of water and increase leaching and podzolization].

29. Runov, E. V., and Sokolov, D. F. Vlijanie opada listvennyh porod na biohimičeskie i mikrobiologičeskie processy v černozemah. [**Influence of the litter of broadleaved species on biochemical and microbiological processes in chernozems.**] *Trud. Inst. Les.* No. 37, 1958 (175–92). 9 refs. [Russ.]

[Cf. *F.A.* 21 No. 3957.] The litter below a 15- to 16-year Oak/Ash stand was cleared, and litter of (*a*) Oak, (*b*) Oak and *Acer* sp. (1/1), and (*c*) Oak and *Caragana arborescens* (3/1) was spread at a rate of 20 metric tons/ha. dry weight. Biochemical and microbiological analyses were made of the litter and the underlying chernozem soil over a period of 14½ months. A correlation was found between the composition of the organic matter of the litter and soil, and the microbiological activity in them. Considerably more microbiological activity was found in soils below litter than in those without a litter cover. Most fixing of the products of litter decomposition was noticed under (*a*) and least under (*b*), where there was relatively high mobility of organic material.

30. Slovikovskij, V. I. Značenie mineralizacii i vyščelačivanija organičeskogo opada drevesnyh i kustarnikovyh porod dlja pitanija rastenij. [**Importance of mineralization and leaching of tree and shrub litter for plant nutrition.**] *Dokl. Akad. Nauk SSSR* 132 (1), 1960 (223–6). 5 refs. [Russ.] A.P.B.

In continued experiments [see *F.A.* 20 No. 32] on the litter of 30 species, results indicated that the observed increase in the % content of total ash in leaves of 26 species after 10½ months' mineralization in lysimeters, depends on the chemical composition of the ash. Litter of plants having a high % of alkali and alkaline-earth metals, and also of Fe, shows a large relative increase in ash. The increase is attributed chiefly to the formation of carbonates (addition of C and O) in old litter, whereas fresh litter yields mainly oxides on ignition at 600° C. Periodic application of materials containing such metals to soils under forest might be considered as a means of increasing the amounts of C and O available for the nutrient cycle.

31. Arol, M. N. Bolu ve civarında bazı göknar, kayın, çam saf ve karışık meşcerelerinde ölü örtü miktarı ile besin maddesi muhtevası üzerine araştırmalar. [**Investigations on the quantity of, and nutrients in, the litter under pure and mixed Pine, Beech and Fir stands in the Bolu region.**] *Zir. Vek. Orm. umum Müd. Yay.* No. 301, 1959. pp. 43 + 2 maps. 36 refs. [Turk.g.]

Tabulates, in the German summary, the amounts (in kg./ha.) of litter, and of N, Ca, K, and P in the litter, under stands of (1) Fir/Beech, (2) Fir/Beech/Pine, (3) Fir/Pine, (4) Beech, and (5) Pine. Total litter and N were greatest under (3); Ca and P were greatest under (1), and K was greatest under (5).

32. Pauli, F. W. **Some recent developments in humus research.** *J. S. Afr. For. Ass.* No. 32, 1958 (8–25). 61 refs. [E.e.afrik.]

A review of selected literature, mainly European

and American, on lignin and humus formation, synthesis of lignin, and formation of humus.

33. MINDERMAN, G. **Mull and mor (Müller-Hesselman) in relation to the soil water regime of a forest.** *Plant & Soil* 13 (1), 1960 (1–27). 19 refs. [E.e.]

Presents a study of the reasons for the distribution and development of mull, mor, and their subtypes (defined) in an area of Oak woodland near Warnsfeld, Holland, believed to have been under forest for some centuries. Data on various soil characteristics were assembled and the frequency of association between them was assessed. No relationship was found between the distribution of forest-floor subtypes and soil pH, and little demonstrable difference between the influence of Oak and of Birch on their development. This development was closely related to soil texture and topography, and variations in it were primarily determined by the soil water regime.

114.4. Soil Classification. Soil Types

See also Nos. 17–9, 21–2, 25, 28–9.

34. MANIL, G. Aspects pédologiques du problème de la classification des sols forestiers. **[Pedological aspects of the problem of classifying forest soils.]** *Pédologie, Gand* 9, 1959 (214–26). 20 refs. [F.du.] O.R.E.

The author defends his own classification of forest soils [cf. *F.A.* 20 No. 44], and discusses brown soils, leached soils, and pseudogleys.

35. RONCHETTI, G. Nota preliminare sulla distribuzione dei suoli in alcune zone boschive trentine. **[A preliminary note on the distribution of soils in some wooded zones of the Trentino.]** *Monti e Boschi* 11 (6), 1960 (264–71). [It.f.e.]

Gives a detailed analysis of a characteristic soil profile found at an altitude of 1600–2000 m.—a typical humus-iron podzol—in N. Italy.

36. OLIVEIRA, A. L. FRANCO DE. Les sols forestiers du Portugal: quelques aspects se rapportant à leur évolution. **[The forest soils of Portugal: some aspects of their evolution.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/60/5-Dc*, 1960. pp. 7. [F.] Limited distribution.

37. MILIN, Ž., and GAJIĆ, M. R. Prilog poznavanju edafskih uslova bukovih šuma (as. *Fagetum montanum*) gospodarske jedinice Južni Kučaj III. **[Edaphic conditions of the Beech forests (*Fagetum montanum*) of the 'Južni Kučaj III' district.]** *Šumarstvo* 12 (9/10), 1959 (491–9). 12 refs. [Serb.f.]

The soils are mostly extremely podzolized, acid, predominantly grey in colour but with ochreous and dark-brown patches, and rich in humus.

38. ČAGINA, E. G. Osobennosti počvoobrazovanija v nizkogor'jah Severnogo Altaja. **[Features of soil formation in the lower hills of the N. Altai.]** *Počvoved.* 1960 (6), (44–52). 18 refs. [Russ.russ.e.] A.P.B.

On N. slopes under Aspen/Fir forests, and on S. slopes under meadow-steppe vegetation there are extensive areas of soils rich in humus. These soils are described, and are thought to be eminently suitable for the planned extension of horticulture in the Altai.

39. NAUMOV, E. M. K voprosu o genezise vtorogo gumusovogo gorizonta v seryh lesnyh pocvah Krasnojarskogo kraja. **[The genesis of the second humus horizon in grey forest soils of the Krasnoyarsk region.]** *Počvoved.* 1960 (3), (59–64). 20 refs. [Russ.e.] A.P.B.

It is concluded that the horizon is a relic of steppe or meadow-steppe soils, which were widespread in the area in the past.

40. ZONN, S. V., and FEOFAROVA, I. I. O novom tipe počv pod temnohvojnymi lesami vostočnogo Tibeta. **[A new soil type under 'dark coniferous' [Spruce and Fir] forests in E. Tibet.]** *Počvoved.* 1960 (6), (11–20 + 1 plate). 9 refs. [Russ.e.] A.P.B.

Gives data on the physical and chemical properties of soils under *Picea purpurea*/Bamboo and *Abies faxoniana*/*A. recurvata*/Rhododendron forests in Szechwan [cf. *F.A.* 21 No. 22], under *P. abies* and *A. alba* in Bulgaria [cf. *F.A.* 21 No. 1342], and also under *P. abies* in N.W. Russia. The soils under the Chinese Spruce and Fir forests form a special type different from podzolic, brown, and dark montane forest soils, viz. subtropical forest soils with a high accumulation of humus substances in the form of Fe humates under the Spruce, and Fe fulvates under the Fir forests.

41. TAKEHARA, H., KUBO, T., and HOSOKAWA, K. **[Forest soils from andesite and volcanic ash of Ontake mountain.]** *J. Jap. For. Soc.* 40 (3), 1958 (99–106). 9 refs. [Jap.jap.e.e.]

Describes morphological features of the forest soils examined, and presents tabulated data showing the chemical properties and mechanical composition of representative profiles, and the dominance of important tree species.

42. SETH, S. K., and YADAV, J. S. P. **Soils of the tropical moist evergreen forests of India.** *Indian For.* 86 (7), 1960 (401–13). 22 refs.

A general description is followed by more detailed descriptions of the soils of the 3 major tropical moist evergreen forest regions in India: the Western Ghats of the Peninsula; the Eastern sub-Himalayan tracts and Upper Assam; and the upper slopes of the hills in the Andamans.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 12, 25–31, 85–7, 241–4, 257, 300, 398, 656–61, 887–90, 909.

43. SVIRIDOVA, I. K. Rezul'taty izučenija vymyvanija azota i zol'nyh èlementov doždevymi osadkami iz kron drevesnyh porod. **[Studies on the leaching of N and mineral elements from tree crowns by rain.]** *Dokl. Akad. Nauk SSSR* 133 (3), 1960 (706–8). 1 ref. [Russ.] A.P.B.

Rainwater was collected in Aug./Sept. 1958 and throughout the 1959 growing season under (1) an Oak stand, 60 years old; (2) Aspen, 42; (3) Pine, 90;

and also on (4) a large clearing, all in the Voronezh area. Results of analyses are tabulated, showing the amounts of N, K, Ca, Mg, S, and P (mg./litre) in the water. No S or P was present in rainwater on (4), and amounts of the other nutrients were least on (4). It is calculated that in the 1959 growing season the following amounts of nutrients (kg./ha.) were leached from the tree crowns in (1): N 6·7, Ca 6·0, K 3·3, Mg 1·2, P 0·3, and S 0·1; in (2): 7·6, 5·1, 2·0, 0·9, 0·2, and 0·1; and in (3) 8·1, 6·0, 1·0, 0·9, traces, and 0·2, respectively. During the growing season, rainfall penetration was 163 mm./sq.m. under (1), 165 under (2), and 197 mm. under (3).

114.6. Soil Biology

See also Nos. 20, 27–9, 426, 646–7, 780.

44. TRIBE, H. T. **Aspects of decomposition of cellulose in Canadian soils. I. Observations with the microscope. II. Nitrate nitrogen levels and carbon dioxide evolution.** *Canad. J. Microbiol.* 6 (3), 1960 (309–23 + 2 plates). 18 refs. O.R.S.

Cellulose film was used for the tests in both parts; some supplementary studies were made with filter paper. The main study was made with a mull humus from the A_1 horizon of a brown forest soil under mixed deciduous trees. (I) Fungi initiated decomposition, bacteria then appeared and, on both, nematodes later occurred. The later stages of decomposition and disintegration were caused by larger animals. Non-homogeneous distribution of the various organisms in the soil samples resulted in considerable variation between pieces of cellulose, some being completely disintegrated, others untouched after 5 weeks. (II) During the early stages of decomposition, nitrate was taken up from the soil, leaving it nitrate-deficient for up to 7 weeks; in the later stages some nitrate was released again. CO_2 was produced from the cellulose throughout the experiment (16 weeks). These processes are broadly correlated with the succession of organisms described in (I). NO_3-N was first taken up by the fungi and bacteria; when they reached maximum development their demands declined or ceased, and N was released to the soil, the two processes contributing to this being autolysis of micro-organisms, and nitrogenous excretion by the soil microfauna. The role of the fauna in N mineralization is briefly discussed.

45. SCHALIN, I. Kangashumuksesta ja sen mikrobitosta. **[Raw humus and its microbial flora.]** *Metsät. Aikak.* 1960 (6/7), (230–2). [Fi.e.]

Conditions in Finnish forest soils favour mould fungi, and bacterial activity is generally inadequate. Thus the humus of these soils generally contains more undecomposed matter than normal humus. *From author's summary.*

46. SEWELL, G. W. F. **The ecology of fungi in *Calluna*-heathland soils.** *New Phytol.* 58 (1), 1959 (5–15). 13 refs. O.R.S.

The soils investigated were collected from widely separated areas in England and Wales.

47. CHRISTENSEN, M. **The soil microfungi of conifer-hardwood forests in Wisconsin.** *Abstr. of thesis*, in *Dissert. Abstr.* 20 (11), 1960 (4253–4). O.R.S.

[Cf. *F.A.* 15 No. 3206.] Populations from 36 forests in northern Wisconsin were studied. The species most frequently found were *Mortierella* spp., *Trichoderma viride*, *Penicillium* spp., *Pullularia pullulans*, *Masoniella* spp., *Paecilomyces carneus* and *Oidiodendron* spp. The species composition of soil microfungal communities proved to be correlated with that of the cover vegetation. Statistical analyses showed that intensity of podzolization and differences in dominant tree species were paralleled by variation in the composition of microfungal communities. Indirect evidence of an antibiotic interaction within the microfungal communities was also obtained. The number of species of microfungi per forest ranged from 11 to 51; greatest variety was found in soils supporting both conifer and broadleaved dominants. Isolate densities for *Penicillia* were highest in mixed forests, but Mucorales were most abundant in predominantly coniferous stands. Plate counts of microfungi—high in Oak, low in Maple soils—were shown to be directly related to viable spores present in the soil suspension. Bacteria and actinomycete densities were highest in Maple soils. Descriptions of 44 new or noteworthy fungi are included.

48. SALAM, M. A., and RAMARAO, P. ***Masoniella indica* sp. nov.** *Curr. Sci.* 29 (4), 1960 (148–9). 3 refs. A.P.B.

Presents a description of this new fungus species in the soils of Narsapur forest, Andhra Pradesh, Hyderabad.

49. RAMBELLI, A. **Research into microfungi in soils planted with Eucalypts.** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/60–10a*, 1960. pp. 5. [E.] Limited distribution.

Lists the species found under 4 Eucalypt plantations (2 near Rome, 1 at Catania and 1 at Cagliari).

50. HAARLØV, N. **Microarthropods from Danish soils. Ecology, phenology.** *Oikos: Suppl.* No. 3, [1960]. pp. 176. 213 refs. [E.e.dan.]

The 8 habitats examined in this detailed survey include a scrub area of ca. 1 ha., consisting chiefly of Hawthorn, but with Spruce, Birch and Willow. [Cf. *F.A.* 15 No. 35.]

51. WOOLLEY, T. A. **Some interesting aspects of oribatid ecology (Acarina).** *Ann. Ent. Soc. Amer.* 53 (2), 1960 (251–3). 10 refs. O.R.S.

Summarizes the food habits and habitat preferences of these mites, and discusses their means of dispersal.

52. DALENIUS, P. **Studies on the Oribatei (Acari) of the Torneträsk territory in Swedish Lapland. I. A list of the habitats, and the composition of their oribatid fauna.** *Oikos* 11 (1), 1960 (80–124). 12 refs. [E.e.]

The habitats include Pine forest and various Birch associations.

53. Eitminavičiūtė, I. Rasprostranenie oribatidnyh kleščej v smešannom lesu. **[Distribution of oribatids in mixed forest.]** *Liet. TSR Mokslų Akad. Darb.* (*Ser. C*) No. 2 (22), 1960 (43–53). 3 refs. [Russ.russ.lith.]

Tabulates data on the distribution of the 103 species of oribatids found in the four mixed forest biotopes examined. The greatest numbers were found in predominantly coniferous forest, but most species were found in mixed forest with ground cover of mosses. The most abundant species were *Notaspis punctatus*, *Tectocepheus velatus* and *Oppia neerlandica*.

54. Atlavinytė, O. Dirvožemio ypatybių įtaka sliekų paplitimui ir jų gausumui. **[Influence of soil properties on the distribution and numbers of earthworms.]** *Liet. TSR Mokslų Akad. Darb.* (*Ser. C*) No. 2 (22), 1960 (55–64). 10 refs. [Lith.lith.russ.]

A study of the distribution and numbers of earthworms as influenced by type, mechanical composition, and pH of the soil, and the parent rock and biotope, in Lithuania. In the non-arable areas examined, earthworm populations decreased in the order: meadows, broadleaved forest, broadleaved/coniferous forest, Spruce forest. None were found in Pine forests.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 258, 490–5, 505–6, 533–8, 1248.

55. **[Forests and water.]** *Lesn. Čas.* 6 (3), 1960 (164–248). [Slovak. or Cz.russ.g.]

Gives abbreviated versions of 11 papers read at a conference on 'Forests and water', at Demänová, Czechoslovakia, 8–10 Oct., 1959. The papers are mainly concerned with the importance of forests in the water regime and for soil protection, and are not summarized individually.

56. Molčanov, A. A. Raspredelenie osadkov v širokolistvennyh lesah. **[The distribution of precipitation in broadleaved forests.]** *Trud. Inst. Les.* No. 37, 1958 (67–82). 2 refs. [Russ.]

In investigations in the Tellerman forest, the precipitation penetrating the canopy in 220-year Oak stands of the *Carex/Aegopodium*, *Carex/Tilia*, and *Euonymus* types was found to be 82·9, 82·6 and 86% respectively of that on open ground. The relative differences in penetration throughout the year were measured from 1951 to 1955, and variations in penetration with intensity of precipitation, stand age, and Oak forest type were determined. Penetration in Ash and Aspen stands was also investigated, though in less detail.

57. Hopkins, B. **Rainfall interception by a tropical forest in Uganda.** *E. Afr. agric. J.* 25 (4), 1960 (254–8). 9 refs.

A tower 120 ft. high was erected in the forest (*Pseudospondias microcarpa/Erythrina excelsa/Piptadeniastrum africanum*, with lianes, an understorey, and a dense herb layer) without felling any trees. Rainfall was measured for ca. 7 weeks by gauges on the ground ca. 2 m. away from each of the four corners of the tower, and also by gauges ca. 1 m. from the E., S., and W. corners of the tower at heights of 30, 60, 90 and 120 ft. Results indicated that ca. 35% of the rain falling on the forest is intercepted before it reaches the ground, and that almost all this interception takes place between ground level and 30 ft. height (i.e. the interception is caused by the herb layer, predominantly *Dracaena fragrans*). The results also suggest that there is a negative correlation between interception and rainfall intensity. Suggestions for future research are made.

58. Yli-Vakkuri, P. Roudan ja lumen metsiköittäisestä vaihtelusta ja sen merkityksestä. **[Snow and freezing of soil in different stands.]** *Metsät. Aikak.* 1960 (6/7), (224–5, 232). 2 refs. [Fi.e.]

The author's studies [to be published more fully elsewhere] indicate that the depth and quality of protective snow cover on a forest floor, and thus the freezing of the soil, vary from stand to stand, and that variations in growing stock influence the melting and thawing of snow and frozen soil. The soil remains cold for an exceptionally long time in dense Spruce stands. *From author's summary.*

59. Kissis, T. Ja. Rezul'taty nabljudenij za vlijaniem massivnyh i polosnyh nasaždenij na raspredelenie snežnogo pokrova i vesennee postuplenie vlagi v počvu. **[Results of observations on the influence of forest blocks and strips on the distribution of snow cover and the infiltration of moisture into the soil in spring.]** *Trud. Inst. Les.* No. 43, 1958 (138–51). 3 refs. [Russ.]

Observations were made on the amount of snow, and the depth to which water from the spring melt penetrated, in and at the margins of 2- to 3-storeyed stands of (*a*) Oak/*Acer* [*platanoides*], (*b*) Elm/Ash, and (*c*) Ash/Oak/*Acer tataricum*. Both the amount of snow, and the depth of penetration in spring were greater in (*a*), (*b*) and (*c*) than on a field. In the snowy winter of 1952/53, most snow accumulated in (*a*) and least in (*c*); in 1953/54, a winter with little snow, (*a*) and (*b*) had equal amounts of snow, while (*c*) had less. In one part of a 7-row, 15-year-old shelterbelt with the middle 5 rows of *Acer negundo* and *Caragana arborescens*, and the other rows of *Elaeagnus angustifolia*, 10–11 times as much snow accumulated in 1953 as in the field, and 20 times as much in 1954. More snow accumulated in the belt than at the margins of the blocks of forest in both winters. Similar trends were noted in a 5-year-old shelterbelt of different species composition.

60. Idzon, P. F. Gidrologičeskie nabljudenija v bassejne reki Medvenki. **[Hydrological observations in the basin of the river Medvenka.]** *Soobšč. Inst. Les.* No. 10, 1958 (37–49). 5 refs. [Russ.]

The studies were made near Moscow in 1955 on the following *Oxalis* sites: (*a*) Birch, 40 years old; (*b*) Pine, 65; (*c*) Spruce, 62; (*d*) as (*c*), 32; (*e*) as (*c*), 93; and also on (*f*) a field of timothy; sites (*a*), (*b*) and (*f*) were also studied in 1954. Soil moisture was measured to a depth of 3·5 m., and results are tabulated for the 0–50, 0–100, and 0–160 cm. layers for various dates from May to Oct. The water balance of the soil under the various stands is

calculated and compared with streamflow records. The effect of forest on soil moisture supplies and streamflow is discussed, and the complexities of the problem are outlined.

61. BURYKIN, A. M. Vlažnost' počvy i ėrozija (na primere vlažnyh subtropikov SSSR). **[Soil moisture and erosion (in the moist Soviet subtropics).]** *Počvoved.* 1960 (3), (88–95). 15 refs. [Russ.e.] A.P.B.

[Cf. *F.A.* 20 No. 4102; 21 No. 41.] In investigations near Sochi on ploughed fields (some compacted, some harrowed), and land under maize, shrubs, and forest (with and without litter), and on felled areas, it was found that the influence of soil m.c. on erosion and run-off varied with rainfall intensity, cover type, and surface condition.

62. BÁNKY, G. A Kisnánai erózióméró állomás három évi munkásságának eredményei. **[Report on the three years' activity of the erosion-control station in Kisnána.]** *Erdész. Kutatás., Budapest* 6 (3), 1959 (1960), (139–64). [Hu.russ.g.e.*russ.g.e.*]

Preliminary report on the first 3 years of a 10-year programme of study on the S. slopes of the Matra Mountains. In the first 4 years, data are being collected on the existing conditions; the forest will then be felled and grazed in the experimental area; finally, in the last 3 years, this area will be reforested in order to determine the effects of reforestation on erosion.

63. NÄNNI, U. W. **Base-flow in Cathedral Peak streams.** *J. S. Afr. For. Ass.* No. 33, 1959 (7–48). 28 refs. [E.e.afrik.]

Describes a study of base-flow (that portion of streamflow percolating to channels after surface and subsurface flow resulting directly from precipitation have run off; it is derived from underground storage in the catchment and is responsible for maintaining streamflow during dry weather), undertaken with the primary object of devising a procedure for determining the effect on base-flow of treatment applied on whole catchments. Explains the mechanical construction of base-flow recession curves, discusses base-flow recession theory, and puts forward a modified hypothesis, tested by application to Cathedral Peak data. Methods for determining the effect of treatment on base-flow are proposed. [Cf. *F.A.* 18 No. 57.]

64. NÄNNI, U. W. **The immediate effects of veld-burning on streamflow in Cathedral Peak catchments.** *J. S. Afr. For. Ass.* No. 34, 1960 (7–12). 8 refs. [E.e.afrik.]

Data from experiments in 1953–59, with some additional data from accidental burns, show no evidence that burning of the natural mountain grassland on unplanted catchments in the Cathedral Peak research station has an immediate detrimental effect on the ground-water discharge.

65. AGRAWAL, S. C., and REGE, N. D. **Controlling soil loss through proper cover (specially in the hills).** *Indian For.* 86 (7), 1960 (440–4). 3 refs.

Reports, with tabulated data, on short-term studies of (1) the effect of different types of natural or cultivated vegetative cover on run-off and soil loss, and (2) the relation of vegetative cover types to humus content, rate of infiltration of water, and porosity, carried out at the Soil Conservation Research Station, Ootacamund (Nilgiris).

66. BHIMAYA, C. P., and KAUL, R. N. **Some afforestation problems and research needs in relation to erosion control in arid and semi-arid parts of Rajasthan.** *Indian For.* 86 (8), 1960 (453–68). 7 refs.

Presents information collected so far in studies on the rehabilitation of the desert region, carried out at the Desert Afforestation and Soil Conservation Station, Jodhpur. The studies cover species trials, climate, soil treatment for afforestation, trial nurseries and plantations, stabilization of shifting sand dunes, etc. Outlines of present and future research are given.

67. **Emergency revegetation of burned watersheds. Annual report—1959.** California Division of Forestry, Department of Natural Resources. 1958. pp. 12.

68. **Watershed management research in Arizona. Progress report 1959.** Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. [1960]. pp. 80. 7 refs.

Contains the following articles: Scope of current watershed management research in Arizona (*H. G. Reynolds*); Research in the mixed conifer type (*L. R. Rich*); Research in the Ponderosa Pine type (*E. F. Aldon*); Research in the Pinyon-Juniper type (*C. M. Skan*); Research in the chaparral type (*G. E. Glendening*); Laboratory and greenhouse investigations on the chemical control of chaparral (*E. A. Davis*); Field investigations on the chemical control of chaparral (*D. T. Lillie*); Research in stream-bottom vegetation (*J. S. Horton, J. P. Decker,* and *H. L. Gary*).

69. MEEUWIG, R. O. **Watersheds A and B—a study of surface runoff and erosion in the subalpine zone of central Utah.** *J. For.* 58 (7), 1960 (556–60). 4 refs.

The two catchments have been under observation since 1912, in order to determine run-off and erosion under a variety of herbaceous cover conditions. The effects of grazing are discussed in detail.

70. HAUPT, J. **Variation in areal disturbance produced by harvesting methods in Ponderosa Pine.** *J. For.* 58 (8), 1960 (634–9). 4 refs.

The area of soil bared on 16 compartments of the Boise Basin Experimental Forest was closely related to the number and volume of trees removed. As timber cut by (*a*) single-tree selection, and (*b*) group selection, increased from 1500 to 6000 trees/sq. mile, the area of soil bared increased from 29 to 114 acres/sq. mile for (*a*) and 29 to 84 for (*b*). Greater dispersal of trees and less repeated use of tractor routes account for the greater bared area with (*a*). In (*b*), tractor size had no significant effect on the area disturbed. *From author's summary.*

71. SEELY, T. S. **An appraisal of the value of five grass species for seeding skid roads and log landings in western North Carolina.** *J. For.* 58 (8), 1960 (642–3).

Control plots and plots treated with lime or lime plus 2–12–12 fertilizer were sown with 5 species of grass. After 4 seasons, *Festuca rubra* var. *heterophylla* was outstanding regardless of plot treatment, and *F. ovina* var. *duriuscula* was next best.

72. JAMES, J. W. **Erosion survey of the Paroo—Upper Darling region. Part III. Vegetation and pastures.** *J. Soil Conserv. Serv. N.S.W.* 16 (3), 1960 (185–206). 12 refs.

Maps and describes alliances within the dry forest, woodland, shrubland and grassland formations, with tables showing: species occurrence and value as fencing material or drought fodder; relationship of alliances and associations to soil; occurrence of main tree and shrub species in various habitats. [Cf. *F.A.* 12 No. 177.]

73. COLCLOUGH, J. D. **Protection of foreshore lands of Burrendong Dam.** *J. Soil Conserv. Serv. N.S.W.* 16 (2), 1960 (127–41). 8 refs.

Describes work undertaken to prevent erosion on the hilly and degenerated foreshore lands of the Burrendong Dam, which has a catchment area of ca. 5360 sq. miles. The removal of livestock and a programme of rabbit extermination are allowing natural cover to return, and some regeneration of *Eucalyptus* and *Callitris* spp. has been noted. Plantations of Eucalypts have also been established.

74. BARCLAY, N., *et al.* **Final report of the Setta Development Committee on the utilization of timber resources in the watersheds of the State [of Victoria].** Government Printer, Melbourne. 1960. pp. 67 + 5 maps.

[Cf. *F.A.* 19 No. 1328.] The terms of reference were mainly confined to the utilization of timber resources of catchments from which town water supply is drawn. The following are among the recommendations made: (1) That all forested catchments be adequately provided with access roads for fire-protection purposes. (2) That the policy of excluding timber mills from forest areas be vigorously adhered to. (3) That uncontrolled logging should not be allowed in any catchment area. (4) That controlled logging be permitted under strict supervision, in accordance with the silvicultural and management practices of the Forests Commission.

14. Systematic Zoology

145.4. Arachnoidea

See also Nos. 51–3.

75. KEIFER, H. H. **New eriophyid mites.** *Ann. Ent. Soc. Amer.* 52 (6), 1960 (649–57). 10 refs. O.R.S.

Describes 13 new European and American species which (with one exception) attack or live on tree leaves or buds.

145.7. Insecta. Entomology

See also Nos. 753 *et seq.*, 1117 *et seq.*

76. MATHUR, R. N. **Immature stages of Indian Lepidoptera. No. 12. Pyralidae, sub-family Pyraustinae.** *Indian For. Rec.* (*n.s.*) *Entomology* 9 (10), 1959 (183–210).

Describes mature larvae of 12 species.

77. PATOČKA, J. Poznámky k bionomii obaleče korunového (*Epinotia nigricana* H.S., Lep.: Tortricidae). **[The bionomics of *E. nigricana*.]** *Zool. Listy, Brno* 9 (3), 1960 (197–208). 13 refs. [Cz.cz.g.*g.*] O.R.S.

78. CUMMING-HOPKINS, M. **Notes on *Hyalophora* spp. from the Forest Insect Survey, Calgary.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (3), 1960 (3). 3 refs.

Notes on life history, as studied in the laboratory, of *H. cecropia*, *H. euryalus*, and *H. gloveri nokomis*.

79. DAVATCHI, A., TAGHI-ZADEH, F., and SAFAVI, M. Contribution à l'étude biologique et économique des Coléoptères phytophages et xylophages de l'Iran. **[Contribution to a biological and economic study of the phytophagous and xylophagous Coleoptera of Iran.]** *Rev. Path. vég.* 38 (4), 1959 (235–52). [F.e.] I.M.I.

Presents brief notes on 47 species of the Cerambycidae, 43 of the Buprestidae and 17 of the Scarabaeidae, many of which are newly recorded from Iran.

80. MATHUR, R. N. **Pupa of *Ozotomerus maculosus* Perroud (Coleoptera, Anthribidae).** *Curr. Sci.* 28 (12), 1959 (501–2). 5 refs. A.P.B.

An illustrated description of the pupa of this sapwood borer.

81. ROCHE, A., and LHOSTE, J. Descriptions d'organes adaptés à la dissémination des champignons chez les Scolytoidea (Coléoptères). **[Description of organs in Scolytoidea adapted to the dissemination of fungi.]** *C.R. Acad. Sci., Paris* 250 (11), 1960 (2056–8). 2 refs. [F.] O.R.S.

Illustrated by photomicrographs.

82. PERKINS, J. F. **Handbooks for the identification of British insects. Vol. VII. Part 2 (a ii). Hymenoptera. Ichneumonoidea. Ichneumonidae, subfamilies Ichneumoninae II, Alomyinae, Agriotypinae and Lycorininae.** Royal Entomological Society of London. 1960. pp. 213. Price £1. 5*s.* [Cf. *F.A.* 21 No. 1396.]

15. Animal Ecology. Game and Fish Management. Hunting, Shooting and Fishing

See also Nos. 276, 284, 682–3, 741, 743 *et seq.*

83. RINEY, T., and BATCHELER, C. L. **Relations between vertebrates and forest after the 1955 fire at Balmoral State Forest.** *Res. Note N.Z. For. Serv.* No. 13, 1959 (1960). pp. 15 + 3 photos, 1 dgm. 1 ref.

The 1955 Balmoral Forest fire, which destroyed or damaged 6000 acres of exotic Pine plantations, affected all vertebrate animals to a greater or lesser degree. The worst affected birds were insect

feeders, particularly native species such as the tomtit. Other insectivorous birds, and the seed-eating fringillids, were apparently not adversely affected; many of them were observed in the burned areas within one week of the fire. Mammals, though severely affected in certain areas, and among which many deaths probably occurred, were not eliminated from any area for a long period. In particular, rapid recolonization by rabbits was apparent. The aerial distribution of four tons of strychnine-coated wheat to reduce the population of seed-eating birds had no positive value and, because much of it germinated and provided a food resource for animals, may have been of negative value. Scarification of the soil of one block resulted in 1·8 times the amount of Pine regeneration that might otherwise have been expected. *Authors' summary.*

84. McKeever, S. **Food of the northern flying squirrel in northeastern California.** *J. Mammal.* 41 (2), 1960 (270–1). O.R.S.

Stomachs of 24 individuals, collected from Jan. to Dec. 1958 from forests of *Pinus ponderosa*, *P. contorta* and mixed *Abies concolor* and *A. magnifica*, were analysed. Although tree seeds were plentiful, none were found in the stomachs examined; the main foods were fungi and lichens.

16. General Botany

160. Plant Chemistry

See also Nos. 25–6, 114, 230, 249, 253, 266, 429–31, 731, 739, 784, 833–4, 1006 *et seq.*, 1202 *et seq.*

85. Asahi, M. **[Studies on the interaction between soil and forest vegetation. (I) Leaf analysis.]** *J. Jap. For. Soc.* 40 (4), 1958 (135–8). 5 refs. [Jap.jap.e.*e.*]

The tree species sampled were classified into 5 groups based on the Ca content of their foliage. Tabulated data are presented showing the ash content of the foliage of the various conifers and hardwoods examined, the chemical composition of the leaves and needles in different seasons, and the relation of sampling direction (point of compass) and location in the stand to the nutrient content of leaves.

86. Ovington, J. D. **The calcium and magnesium contents of tree species grown in close stands.** *New Phytol.* 58 (2), 1959 (164–75). 14 refs. O.R.S.

[Cf. *F.A.* 20 No. 4120.] The %s of Ca and Mg at different positions in the boles and canopies of a number of sample trees from experimental areas at West Tofts, Bedgebury, and Abbotswood are given in tables and graphs. Trees were in the ranges 18–23 and 46–47 years old. Maximum contents per tree were Ca 1139 g. and Mg 209 g. Contents of Ca and Mg in younger trees tended to be larger in the crowns, and in older ones in the boles. Occasionally hardwoods contained greater quantities than conifers, but the reverse was more common. Differences in contents in individual trees primarily reflected variations in growth of the different species. A linear relationship was found between the logarithms of dry weight of trees and those of the weights of Ca or Mg in them. Total amounts of Ca and Mg contained in all the trees were in the ranges Ca 119–674 kg./ha. and Mg 19–113 kg./ha. Differences in thinning intensities between species and experimental areas have affected the results considerably. The standing trees contained a relatively large proportion of the Ca and Mg present in the ecosystems. Smaller amounts were contained in the ground flora, but in fairly mature plantations with very open canopy, the herb layer contained significant weights of the two elements, and with a well developed ground flora the annual turnover of plant nutrients from this vegetation may exceed that from fallen leaves and the breakdown of the tree litter. The balance and circulation of Ca and Mg within the ecosystem are discussed.

87. Karschon, R. **Levels of major elements in Eucalypt leaves.** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/*60–12*a*, 1960. pp. 5. 6 refs. [E.]

As a supplement to a previous paper on trace elements in Eucalypt leaves [see *F.A.* 20 No. 4121], the present paper gives analytical results for ash, N, P, and K in leaves of (*a*) *Eucalyptus rostrata* and (*b*) *E. gomphocephala* from trees on both calcareous and non-calcareous soils. Results are tabulated for a number of soils. The average ash content of (*a*) was considerably higher than that of (*b*). Average values of N, P, and K were of the same order of magnitude in both species, but values of N and P had a wider range in (*a*) and those of K in (*b*). In (*a*) there was no evidence of consistently low N and K values for any given soil type, but values of leaf P were consistently below average on loess soils. In (*b*), both high and low N values occur on most soils, but high values occur consistently on marl soils. Consistently low P occurs on loess; K is consistently low on loess and rendzinas.

88. Denaeyer-de Smet, S. La répartition du manganèse dans une chênaie à bouleau. I. La répartition du manganèse dans la strate arborescente. **[The distribution of Mn in a mixed Oak/Birch stand [with some Beech]. I. Distribution of Mn in the tree layer.]** *Lejeunia, Liége* 22, 1958 (1–18). 11 refs. [F.f.] P.R.

The Mn content of representative samples taken from the large wood (boles, and branches of > 3 in. diam.), and the twigs and leaves of three 40-year trees (Oak, Beech and Birch) previously felled and checked individually for dry-matter content, was determined colorimetrically. For each species, marked variations in relative Mn content according to the tree parts, were observed. Expressed in relation to ash weight, Mn content was highest in leaves for Oak (18,000 p.p.m.) and Birch (27,000 p.p.m.) and in twigs and small wood for Beech (10,300 p.p.m.). In relation to total dry weight of the parts, Mn content was highest, for all 3 species, in the leaves (350–1400 p.p.m.), and lowest in the large wood (30–70 p.p.m.). For all parts analysed, Mn content was higher in Oak than in Birch and Beech, Oak bark in particular containing respectively 6 and 9 times as much Mn as Beech and Birch bark

From the total content of 37 g. for the Oak (i.e. 4 and 6 times as much as that for the Beech and Birch), the total Mn content per ha., for the tree layer studied, is estimated at ca. 14 kg., of which 11·2 kg. are held in 302 Oak, 2·6 kg. in 296 Birch and 0·2 kg. in 20 Beech trees.

89. MIROV, N. T. **Cosmic rays and old Pine stumps.** *Amer. Forests* 66 (6), 1960 (30–1, 54).

A semi-popular note on the determination of C^{14} in turpentine from old stumps and living trees with the object of tracing changes in the content of C^{14} in the atmosphere.

90. MOŽEJKO, L. N., and JAUNZEMS, V. R. Polumikrometod opredelenija uronovyh kislot s primeneniem vysokočastotnogo titrovanija. [**A semi-micro method of determining [the amount of] uronic acids [in plant material] by means of high-frequency titration.**] *Gidrol. lesohim. Prom.* 12 (3), 1959 (7–9). 6 refs. [Russ.russ.] P.R.

91. BARNES, R. L., and NAYLOR, A. W. **Studies on the ornithine cycle in roots and callus tissues of *Pinus serotina* and *P. clausa*.** *Bot. Gaz.* 121 (2), 1959 (63–9). 35 refs. O.B.D.

Isolated roots of *P. serotina* and root-callus tissue cultures of it and *P. clausa* were used in studies of the ornithine-urea cycle. Ornithine-2-C^{14} was surmised to be used by plant material (1) via citrulline and arginine, and (2) via glutamic semialdehyde to glutamic acid and proline. Both roots and callus tissue incorporated $C^{14}O_2$ in darkness into citrulline as well as into the usual products of dark CO_2 fixation. The amount of $C^{14}O_2$ incorporated into citrulline was increased either by growing the plant materials on a medium containing ornithine before supplying $HC^{14}O_3$, or by incubating the tissues simultaneously with ornithine and $HC^{14}O_3$. Na-formate C^{14} was also utilized partly via citrulline. Oxidation of formate to CO_2 in the tissue may account for some of the observed results. *P. serotina* was more active than *P. clausa* in metabolizing ornithine-2-C^{14}, $NaHC^{14}O_3$, and Na-formate C^{14} via citrulline and arginine. A complete cyclic process, leading to urea synthesis, was not demonstrated in the tissues studied. *Authors' summary.*

92. PRIDHAM, J. B. **Oligosaccharides and associated glycosidases in Aspen tissues.** *Biochem. J.* 76 (1), 1960 (13–7). 43 refs. O.R.S.

Sucrose is the main oligosaccharide present in both the cambial region and young-xylem elements of Aspen [*Populus tremuloides* and *P. grandidentata*]. Raffinose and 1^F-β-fructosylsucrose are also present, the former being mainly associated with the xylem and the latter with the 'soft xylem' [newly differentiated tissue consisting of fibres, vessels and some cambial cells]. A protein preparation from the 'soft phloem' [tissue consisting of young phloem and cambial elements], when incubated with sucrose, produced glucose, fructose and 1^F-β-fructosylsucrose. The preparation also exhibited marked α- and β-glucosidase and α-galactosidase activities. *Author's summary.*

93. PLOUVIER, V. Nouvelles recherches de cyclitols dans quelques groupes botaniques; signification phylogénique du séquoyitol. [**Fresh studies on the cyclitols of some botanical groups; phylogenetic significance of sequoyitol.**] *C.R. Acad. Sci., Paris* 251 (1), 1960 (131–3). 4 refs. [F.f.] O.R.S.

Sequoyitol was isolated from needles or cones of *Tsuga canadensis*, *Pinus* spp. and *Picea glauca*, dambonitol from three Apocynaceae (*Nerium oleander* and *Vinca* spp.), viburnitol from six Compositae, and quebrachitol from various plants, including *Celtis occidentalis* and *Aesculus parviflora*.

94. RANGASWAMI, S., and SAMBAMURTHY, K. **Chemical examination of the leaves of *Rhododendron nilagiricum* Zenk.** *Proc. Indian Acad. Sci.* 50 *A* (6), 1959 (366–73). 16 refs. O.R.S.

The examination of the leaves [poisonous to cattle] by extraction with solvents is described. Ursolic acid, epifriedelinol and hyperoside have been isolated and characterized. *From authors' summary.*

95. ISHIMASA, S. [**Studies on the components of *Sophora japonica* L. III. On the stereochemistry of sophoradiol. IV. On the optical rotatory dispersion curve of the derivative of sophoradiol.**] *J. Pharm. Soc. Japan* 80 (3; 5), 1960 (304–10; 698–9). 13 refs. [Jap.e.*e.*] O.R.S.

96. SUDA, S. **On the physiological properties of mimosine.** *Bot. Mag., Tokyo* 73 (862), 1960 (142–7). 15 refs. [E.e.jap.] I.M.I.

Presents a study of the properties of mimosine and discusses in connexion with these properties the mechanism of sleeping movement in *Mimosa pudica.*

97. SUSSEX, I. M., *et al.* **Extraction and biological properties of an antifungal fraction of woody plant tissues.** *Bot. Gaz.* 121 (3), 1960 (171–5). 14 refs. O.B.D.

Secondary phloem of Lilac was found to contain a substance inhibiting the growth of *Cytospora* sp. Slighter inhibition was also caused by xylem and leaf extracts of Lilac and by phloem extracts of *Ailanthus altissima*, *Catalpa bignonioides*, *Fraxinus americana*, and *Ligustrum vulgare*. The extract of *Robinia pseudoacacia* was inactive.

161. Physiology

See also Nos. 43, 91, 141, 159, 165–9, 228 *et seq.*, 408, 456, 463, 529, 784, 832–4, 1121, 1220–1.

98. HENDRICKSON, W. H., and VITÉ, J. P. **The pattern of water conduction and tracheidal alignment in Douglas-Fir.** *Contr. Boyce Thompson Inst.* 20 (6), 1960 (353–61). 10 refs.

[Cf. *F.A.* 21 No. 1421.] The water conduction and tracheid alignment of 15 seedlings, together with 36 trees ranging from 8 to 250 years, as well as the slope of grain of 363 weathered logs of Douglas Fir were inspected by means of dye injection and mechanical techniques. The water was found to ascend along tracheid conduits which are arranged in a distinct general pattern round the tree axis.

However, a wide range of individual variation was observed. A change in deviation of the alignment of the fibres with respect to the tree axis was found within the same growth ring from the tip of a tree down to its base, and within a transverse section from the pith towards the periphery, according to the age of the wood section. Starting with a slight deviation to the right or a more or less parallel run at the tip and adjacent to the pith, the tracheid conduits soon deviated to the left and later changed back to the right. Usually, a run parallel with the tree axis was evident in the wood aged between 45 and 90 years. The tracheidal conduits in the early springwood always deviated to the left of the later springwood and the summerwood. In contrast to other conifers, the tracheidal conduits of adjacent growth layers were found to ascend in nearly the same sector along the entire stem, although the sector wound round the stem axis. Indications of an environmental influence upon the path of water conduction are discussed. *From authors' summary.*

99. VIEWEG, G.H., and ZIEGLER, H. Thermoelektrische Registrierung der Geschwindigkeit des Transpirationsstromes. I. **[Thermoelectrical recording of the rate of the transpiration stream. I.]** *Ber. Disch. Bot. Ges.* 73 (6), 1960 (221–6). 5 refs. [G.g.] O.B.D.

A heating element kept at a constant temperature is introduced into the tree so that the end reaches 10 mm. beyond the cambium. Five temperature-recording instruments are also introduced at varying distances above and below the heating element. The amount of variation in the temperatures recorded is a measure of the rate of sap flow. The method is extremely sensitive, and will record rates as low as 3 cm./hr. By this method it was demonstrated that the vessel content of *Betula lenta* during the season of sap flow moves, if at all, at a rate of 3 cm./hr. The rate of movement of the transpiration stream in a 60-year-old *Larix decidua* was measured over a whole growing season, and the daily course plotted. A different course for fine and bad days was established. No lowering of the rate at mid-day or during the summer was recorded. [Cf. *F.A.* 21 No. 78.]

100. DECKER, J. P., and WIEN, J. D. **Transpirational surges in *Tamarix* and *Eucalyptus* as measured with an infrared gas analyzer.** *Plant Physiol.* 35 (3), 1960 (340–3). 5 refs. O.R.E.

An intact twig of *T. pentandra* or a leaf of *Eucalyptus* sp. was sealed in an illuminated, constant-temperature glass chamber ventilated at a known rate with dry air. Absolute humidity of air flowing from the chamber was recorded continuously by an infrared gas analyser. Humidity multiplied by ventilation rate gave transpiration rate. Transpiration increased smoothly to a new constant rate during illumination, and decreased smoothly upon darkening. When a twig or petiole was severed in air, transpiration accelerated briefly in a smooth surge and then declined. Behaviour was variable when the cut was made under water, but transpiration usually slowed to a new constant rate, and then surged briefly when the cut was exposed to air. *Authors' summary.*

101. DADYKIN, V. P., DAVYDOVA, JU. A., and AKULOVA, E. A. O dinamike rashodnoj časti ėnergetičeskogo balansa list'ev vysših rastenij. **[Dynamics of the expenditure of energy by leaves of higher plants.]** *Dokl. Akad. Nauk SSSR* 131 (2), 1960 (449–52). 25 refs. [Russ.] A.P.B.

Investigates the dynamics of the most important components of the energy expended by leaves (in transpiration and heat exchange with the surrounding air) in relation to the incident radiation (i.r.). Test plants included *Betula verrucosa*, *B. pubescens*, *Quercus robur*, *Acer platanoides* and *Tilia cordata*, in glasshouses and in the forest. Relative leaf temperatures were measured with thermocouples, and transpiration by weighing of potted seedlings or cut shoots. Graphs are presented showing the relation of the total energy expenditure by the leaves to (*a*) steady i.r.; (*b*) smoothly rising and falling i.r., and (*c*) rapidly rising and falling i.r. The results cast some doubt on the common belief that absorption of radiation by the plant is constant, and seem to indicate that at any given time the plant will absorb only as much radiant energy as is necessary to meet its demands.

102. HLEBNIKOVA, N. A., and MARKOVA, M. I. Vlijanie stepeni osveščennosti na vodnyj režim drevesnyh porod v uslovija Prikaspijskoj Nizmennosti. **[The influence of the amount of insolation on the water regime of woody species in the Cis-Caspian lowland.]** *Trud. Inst. Les.* No. 37, 1958 (216–27). 22 refs. [Russ.russ.]

Complementary observations [see *F.A.* 21 Nos. 2727, 4020, 4025] were made on four-year-old specimens of *Ulmus pumila* var. *arborea* and *Elaeagnus angustifolia* on solonetz soils (*a*), *Fraxinus pennsylvanica* on light-chestnut soils (*b*), and *F. pennsylvanica*, *Acer negundo*, and *U.p.* var. *arborea* on dark soils well supplied with water in a depression (*c*). It was found that during hot, dry, windy weather, the stomata of leaves receiving direct insolation closed during the hottest time of day, while those of shaded leaves usually remained open. Stomatal regulation of transpiration was noted only under conditions where the plants had sufficient moisture. The rate of transpiration of insolated leaves was ca. 2·4 times that of shaded leaves. *E. angustifolia* has the greatest capacity for transpiration, and is a dangerous competitor of *U.p.* var. *arborea* in mixed stands. In such stands on (*a*), the entire annual precipitation is used in transpiration. In (*c*), the amount of moisture used by the trees is 1·5–3 times the total precipitation.

103. KOSOUROV, JU. F. Vodnyj režim drevesnyh porod v polivnyh i nepolivnyh kul'turah. **[Moisture regime of woody species in irrigated and non-irrigated plantations.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (80–9). [Russ.]

Transpiration, leaf and wood moisture content, and increment were determined for *Fraxinus pennsylvanica*, *Ulmus pumila* var. *arborea* and

Robinia pseudoacacia growing in the Sarpa depression (Stalingrad region) on (1) light-chestnut, light clay-loam soil, with irrigation, (2) dark medium-clay-loam soil, with irrigation, and (3) as (2) but without irrigation. The lower limit of optimum soil m.c. was 60–70% of field capacity; below this, increment slackened and then stopped completely. Intensive transpiration was associated with a high daily rate of increment, and was observed only when soil moisture supplies were good. Leaf and wood m.c. were also determined by soil moisture.

104. SUDNICYN, I. I., and CEL'NIKER, JU. L. O sootnošenii davlenija počvennoj vlagi i sosuščej sily list'ev drevesnyh porod. [**The relationships between soil moisture tension and the suction force of tree leaves.**] *Dokl. Akad. Nauk SSSR* 131 (6), 1960 (1457–9). 13 refs. [Russ.] A.P.B.

In continued studies [see *F.A.* 19 No. 1349; 20 No. 4058; 21 Nos. 4017–8] it was found that the correlation between the suction force *S* of the leaves of all three species and the total soil moisture (s.m.) to a depth of 200 cm. was 0·8–0·9; the relation between s.m. tension (*H*) and s.m. to 200 cm. was also close (0·82 for the 0–10 cm. layer; 0·87 for 10–50; and 0·95 for 50–200 cm.). Comparison of the availability to trees of moisture in different horizons with the actual moisture loss (using data on changes in soil m.c. and the transpiration rates) also showed a satisfactory fit (0·8–0·9).

105. KRASULIN, N. P., and PANKRATOVA, N. M. Transpiracija kak pokazatel' pogloščenija vody kornevoj sistemoj duba i jasenja. [**Transpiration as an indicator of water uptake by the roots of Oak and Ash.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (171–4). [Russ.]

Another account of work already noticed [see *F.A.* 19 No. 84].

106. FERRI, M. G. **Contribution to the knowledge of the ecology of the "Rio Negro *Caatinga*" (Amazon).** *Bull. Res. Coun. Israel* 8*D* (3/4), 1960 (195–208). 14 refs.

The Amazonian *caatingas* are enclaves of poor, open, evergreen forest in the rain forest. Studies were made in Taraquá in the upper Rio Negro where the yearly rainfall may be > 4000 mm. and few months have < 100 mm. Soils in general are very poor. Data are reported for 27 of the commonest species, of various biological groups, on daily course of transpiration, degree of stomatal opening throughout the day, rate of stomatal movements and cuticular transpiration, and saturation deficits. In general, results showed (1) no pronounced modification of stomatal openings during daylight, (2) no restriction of transpiration throughout the day, (3) high cuticular transpiration, (4) very slow stomatal reaction in severed leaves, and (5) saturation deficits generally ≯ 5% of the max. water content. It is concluded that water is not the limiting factor in these *caatingas*, but that the vegetation, like that of the *cerrados*, seems to be conditioned by soil deficiencies. The anatomical features and water relations of the vegetation are very similar to those of the Brazilian *cerrados*. [Cf. *F.A.* 21 No. 221.]

107. SLATYER, R. O. **Aspects of the tissue water relationships of an important arid zone species (*Acacia aneura* F. Muell.) in comparison with two mesophytes.** *Bull. Res. Coun. Israel* 8*D* (3/4), 1960 (159–68). 12 refs.

Tissue-water relationships of (*a*) *Acacia aneura* in terms of relative turbidity, diffusion pressure deficit (d.p.d.), and osmotic pressure, were compared with those for two mesophytes (*b*) tomato and (*c*) Privet. *A. aneura* proved much more resistant to desiccation than the other two species. A d.p.d. of 15 atm. reduced the relative turgidity in (*a*) to only 92% whereas in (*b*) it was reduced to 73%, and in (*c*) to 87%. To reduce relative turgidity to 50% a d.p.d. of nearly 60 atm. was required for (*a*), 22 atm. for (*b*) and 38 atm. for (*c*). Tissue of (*a*) recovered from a d.p.d. of ca. 130 atm., without injury, while d.p.d.'s of 45 and 90 atm. proved lethal to (*b*) and (*c*) respectively. A feature of the d.p.d. developed in (*a*) was that it could be only partially explained by increasing osmotic pressure, whereas in the other species the d.p.d. was satisfactorily explained on this basis. *From author's summary.*

108. LARCHER, W. **Transpiration and photosynthesis of detached leaves and shoots of *Quercus pubescens* and *Q. ilex* during desiccation under standard conditions.** *Bull. Res. Coun. Israel* 8*D* (3/4), 1960 (213–24). 32 refs.

Continuous measurements were made of transpiration and assimilation in severed shoots and leaves of *Q. pubescens* and *Q. ilex* exposed to 22° C., 10,000 lux, and 550 mg./hour evaporation from discs of filter paper. Under these conditions, both total transpiration and net assimilation of *Q. pubescens* reached their highest values at a water-saturation deficit (s.d.) of ca. 5·5% of saturation weight, whereas *Q. ilex* reached the highest values at s.d. of ca. 8%. Closure of stomata reduced CO_2 absorption to a rate no longer measurable, while transpiration became exclusively cuticular. In *Q. ilex*, closure of stomata was quicker and more effective than in *Q. pubescens*. Stomatal transpiration and net assimilation ceased in *Q. pubescens* when the s.d. reached 19·5–20%; in *Q. ilex* the corresponding value was 17%. In times of drought, *Q. ilex* has thus a clear advantage, accentuated by its very high resistance to cuticular transpiration, over *Q. pubescens*. Under the conditions of the experiment the s.d. at which both species attained, with maximum water economy, the relatively highest rates of assimilation, ranged ca. 4–5% above the s.d. at which net assimilation rate attained the highest absolute values.

109. BRAY, J. R. **The chlorophyll content of some native and managed plant communities in central Minnesota.** *Canad. J. Bot.* 38 (3), 1960 (313–33). 16 refs. O.R.S.

Concentration of chlorophyll per unit area of land surface was measured for 6 forests and 13 native and managed herbaceous stands. A highly significant correlation was found between chlorophyll content and dry weight of the above-ground crop of annual herbaceous stands. All stable natural herbaceous stands had an approximately similar

ratio of chlorophyll to dry weight of above-ground parts. Chlorophyll content in grams/sq. m. of land surface along an upland gradient from field crop through native communities of increasing age or successional development or both, was *Zea mays* (2·7), *Soja max* (0·9), younger to older successional stages of old field (0·3 to 0·6), native prairie (0·7), xeric (more open) savanna (0·6), mesic (less open) savanna (1·0), conifer/hardwood forest (3·1). Chlorophyll content for a pond hydrosere from the *Nymphaea odorata* margin through *Carex lasiocarpa* to *Chamaedaphne calyculata* shrub and *Larix laricina* forest increased from 0·3 to 1·4 g./sq. m. Values for a younger and an older *Populus tremuloides* lowland grove were 1·7 and 5·9. There was a highly significant correlation between chlorophyll content and height of arboreal stands. Chlorophyll concentrations and wet and dry weights for various plant parts are presented for 7 tree samples, (*P. tremuloides*, *L. laricina*, *Quercus macrocarpa* and *Q. ellipsoidalis*, *Pinus banksiana*), and the presence of chlorophyll in other than leaf parts is emphasized. *From author's summary.*

110. PISEK, A. **The nature of the temperature optimum and minimum of photosynthesis.** *Bull. Res. Coun. Israel* 8*D* (3/4), 1960 (285–9). 18 refs.

A review based on (mainly European) literature.

111. KOLESNIČENKO, M. V. Vlijanie vydelenij berezy borodavčatoj (*Betula verrucosa* Ehrh.) na fotosintez duba čereščatogo (*Quercus robur* L.). [**The influence of *B. verrucosa* secretions on photosynthesis in *Q. robur*.**] *Dokl. Akad. Nauk SSSR* 132(1), 1960 (220–2). 6 refs. [Russ.] A.P.B.

The author measured the photosynthesis, in Aug.–Sept., of 2-year-old Oak seedlings subjected *in vitro* to (*a*) volatile products from bruised leaves on Birch branches placed in the same chamber, and (*b*) watering with aqueous solutions of root exudates obtained by steeping Birch roots. Photosynthesis was increased by (*a*), foliage from mature Birch having a greater effect than that of young Birch; (*b*) depressed photosynthesis. Results from (*a*) and (*b*) applied in combination were inconclusive. The method might have applications in the determination of suitable species mixtures.

112. GUBAREVA, V. A. Opyt èksperimental'nogo izučenija vzaimovlijanija drevesnyh rastenij putem vozdejstvij vydelenij kornej i list'ev. [**Study of interactions between woody plants caused by root and leaf secretions.**] *Dokl. Akad. Nauk SSSR* 131 (6), 1960 (1454–6). 5 refs. [Russ.] A.P.B.

Studies were made of the effect on germination of acorns [*Quercus robur*?] and subsequent seedling height growth of watering with aqueous extracts of comminuted roots (*a*), and dry leaves (*b*), of Oak, Maple, Ash, Lime and Hazel in ten different combinations, and with distilled water (with and without added fertilizers). In all cases, emergence was quickest in pots watered with (*a*), but the effect varied with the species from which the extract was derived. An extract from Oak and Ash roots gave the quickest emergence, followed by one from Maple and Ash. Some root extracts delayed emergence. Emergence was generally retarded by (*b*). Total germination % was rather lower with (*a*) than with (*b*); but first-year seedling survival with (*a*) was 100%. The period of shoot growth was reduced by (*a*) derived from Oak, Ash, and Oak + Ash + Maple + Lime, and by (*b*) from Maple, and Oak + Ash; it was increased by (*a*) from Maple, and Oak + Ash, and by (*b*) from Oak, Ash, and Oak + Ash + Maple + Lime. Each extract examined exerted both positive and negative effects on the growth of seedlings at different periods of the growing season.

113. MONSI, M. **Dry-matter reproduction in plants 1. Schemata of dry-matter reproduction.** *Bot. Mag., Tokyo* 73 (861), 1960 (81–90). 63 refs. [E.e.] I.M.I.

'Reproduction', in the author's sense, is the transformation of photosynthates into new plant tissues. Net assimilation of leaves depends on the quantity of photosynthetic tissue as well as environmental factors. After allowing for non-foliar respiration, the plant's net assimilation is used to 'reproduce' new photosynthetic and non-photosynthetic tissue. The ratio (in dry weight) of completed tissues to the primary photosynthates (or storage foods) is the 'transformation factor' or 'economic ratio'. The argument is extended to the whole life cycle and applied to some representative life forms, viz. therophytes, cryptophytes and hemicryptophytes, herbaceous phanerophytes, trees with annual leaves, and trees with perennial leaves. Plant activity is represented schematically in terms of the 'production system'—the site of the 'production process' giving a certain 'yield' which is subject to a 'transformation process' to 'reproduce' more of the production system. The concepts are illustrated from Stålfelt's 1921 data for photosynthesis of leaves of *Pinus sylvestris* and *Picea abies* at different light intensities. With certain assumptions, it is calculated that survival of seedlings of the Pine is ensured by a light intensity $\geqslant 12\%$, whereas the Spruce would tolerate 9%, owing to longer leaf retention and lower respiration of its non-photosynthetic tissue.

114. KUROIWA, S. **Ecological and physiological studies on the vegetation of Mt. Shimagare. IV. Some physiological functions concerning matter production in young *Abies* trees.** *Bot. Mag., Tokyo* 73 (862), 1960 (133–41). 44 refs. [E.e.jap.] I.M.I.

[Cf. *F.A.* 21 No. 2917.] Photosynthesis, respiration, needle thickness and N content were measured for dominant, intermediate and suppressed trees in a 20-year-old Fir stand, mainly (1) *Abies mariesii* and (2) *A. veitchii*. Needle thickness increased with needle age and tree size, and was in general greater in (1) than (2). Photosynthesis, respiration and N content of needles decreased with age of needles and with diminishing size of the trees. These functions and N content were generally higher in (2) than (1), especially on a weight basis. Needles of dominant trees showed the characteristics of sun leaves, and those of suppressed trees, characteristics of shade leaves. Optimum leaf temperature for gross photosynthesis was ca. 20°. Respiration and N content in

branchlets decreased when calculated on a dry-weight basis, but increased when calculated per unit surface area, with increasing diameter. Respiration of the entire stem and root system was greater in dominants and intermediates than in the suppressed trees. *From author's summary.*

115. KUROIWA, S. **Ecological and physiological studies on the vegetation of Mt. Shimagare. V. Intraspecific competition and productivity difference among tree classes in the *Abies* stand.** *Bot. Mag., Tokyo* 73 (863), 1960 (165–74). 17 refs. [E.e.jap.] I.M.I.

Intraspecific competition for weight increase was analysed in a 20-year-old mixed *Abies mariesii* and *A. veitchii* stand. Trees were classified into dominants, intermediate, and suppressed, and annual dry-matter increments in needles, branches, stems and root were estimated. Annual net production (i.e. the total of these increments per tree), relative productivity (i.e. net production/tree weight), net assimilation rate, and relative growth rate, all increased with a rising tree-weight class. The high proportion of needles in the total dry weight, and the high light intensity received by them, were responsible for high productivity in the dominant class. Gross annual production per tree was calculated in each tree-weight class by estimates of the photosynthetic activity. Annual losses by respiration were also calculated. Net production, calculated by subtracting the latter from the former, agreed with values obtained by totalling annual weight increments as above. Suppressed trees had a relatively low gross production, and a high respiration loss, calculated on dry weight. With the dominants the reverse was true. *From author's summary.*

116. MORK, E. Om sambandet mellom temperatur, toppskuddtilvekst og årringens vekst og forvedning hos gran (*Picea abies* (L.) Karst.). [**The relationship between temperature, leader growth, and growth and lignification of annual rings in Spruce.**] *Medd. Norske Skogforsøksv.* 16 (4), No. 56, 1960 (227–61). 17 refs. [Nor.nor.e.*e.*]

Measurements were made at 7-day intervals in two areas, at 150 and 860 m. alt., each near a meteorological station. Results for both altitudes showed a close correlation between mean temperatures of the six warmest hours of the day and the leader increment % per 24 hours. Soil moisture appeared to be a limiting factor, the correlation between growth and temperature in 1959 being closer for trees on moist than for those on dry soils. In the dry summer of 1959, total leader length was considerably greater on the moister soils, whereas in the cool, wet summer of 1958, it was larger on dry soils. Growth began at roughly the same time on moist and dry soils, but was at first faster on the dry soils; after 3 weeks, trees on moist sites reacted more strongly to high temperatures. Growth ended a week earlier on dry soils. The leader-growth period in the lowlands lasted ca. 8 weeks and in the mountains ca. 6. Growth on dry soils was related more closely to rainfall, and on wet ones to summer temperatures. In the lowland forest, diameter growth began a week before leader growth and lasted 2 weeks longer in autumn (a total of 11 weeks). Lignification began 3 weeks after cambial growth and was complete 8 weeks later. In the mountain forest, diameter growth began 20 days earlier and ended a week later than leader growth; lignification began 3–4 weeks after diameter growth and was complete 5 weeks later. If trees are felled 4 weeks after growth begins, practically none of the current year's increment will be included in the wood volume; after 6 weeks, ½ the increment in the lowlands and ¼ in the mountains, and after 8 weeks, 80% and 75% respectively will be included.

117. THOMAS, J. B. **Shoot growth of Jack Pine, Lake Nipigon Region.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (3), 1960 (2).

Shoot growth was measured weekly on a number of young trees during the growing seasons of 1957–59. The course of growth was remarkably similar in the 3 years. Growth of the leader and of branch terminals began at the same time, but the latter stopped 2–3 weeks earlier. Leader growth rate was about double that of branch terminals throughout the active growing period. Most of the growth took place during a relatively brief part of the season—73, 63, and 79% of the total growth, in 1957, 1958, and 1959 respectively, occurred during a 5-week period. Measurement of the position of the internodal whorls of branches common in Jack Pine leaders, showed that growth occurred simultaneously between internodal whorls and above the uppermost whorl for a part of the season, and that cessation of growth progressed from the basal portion upwards.

118. HICKS, W. W. **A series of experiments on trees and plants in electrostatic fields.** *Journal of the Franklin Institute, Philadelphia* 264 (1), 1957 (1–5). 1 ref. O.R.S.

Describes small-scale experiments on the effects on various plants, including a few woody species, of exposure to natural and artificial electric fields (formed by means of antennae attached to stems, or wire cages or copper rings suspended above them). Both positive and negative artificial fields were tried, and both stimulated growth as compared with controls, as did the natural fields also.

119. POLOZOVA, L. JA. Rost pobegov duba v svjazi s processami plodonošenija. [**Growth of Oak shoots in relation to processes concerned in fruit-bearing.**] *Soobšč. Inst. Les.* No. 9, 1958 (3–17). 22 refs. [Russ.]

In 1953–56, observations were made in the Tellerman Forest on shoot growth of Oaks 15, 20, 45, 60 and 220 years old. Shoot length, and the number of rudiments per shoot, differ in different years on the same tree, in relation to weather and internal factors (sexual specialization of the shoot and tree age). Shoots bearing ♀ inflorescences, and thus fruiting, are longer and have more rudiments than non-fruiting shoots. Positive correlations were established between shoot length and the number of rudiments, and between shoot length and the number of ♀ peduncles per shoot. A close relationship appears to exist in the annual cycle of shoot development between growth and reproductive processes, particularly ♀ sexual specialization. [Cf. *F.A.* 21 No. 1439.]

120. CODACCIONI, M. Étude expérimentale du développement anticipé des bourgeons axillaires de *Fagus silvatica*. **[Experimental study on the development, brought about prematurely, of axillary buds of *F. sylvatica*.]** *C.R. Acad. Sci., Paris* 250 (12), 1960 (2253–4). [F.f.] O.R.S.

Suppression of the terminal meristems brings about the development of axillary shoots carrying 4–6 leaves and a reduced number of scales or sometimes none.

121. ROW, V. V. **Growth regulants in Maple bark and flowers.** *Contr. Boyce Thompson Inst.* 20 (6), 1960 (381–3). 4 refs.

The bark from (*a*) healthy *Acer platanoides* and from (*b*) trees that had developed large burls, both contained IAA, but that from (*b*) also contained two other growth regulators not present in (*a*). Extracts from flowers of *A. platanoides* showed no activity in bioassay, but those from *A. saccharinum* did.

122. BULARD, C., and MONIN, J. Action de l'acide gibbérellique sur des embryons dormants d'*Evonymus europaeus* cultivés *in vitro*. **[Action of gibberellic acid on dormant embryos of *E. europaeus* grown *in vitro*.]** *C.R. Acad. Sci., Paris* 250 (17), 1960 (2922–4). 3 refs. [F.] O.R.S.

Studies the role of the cotyledons in embryo dormancy.

123. BULARD, C., and MONIN, J. Graines et embryons dormants d'*Evonymus europaeus*: différentes modalités dans l'éveil de leur dormance par l'acide gibbérellique. **[Dormant seeds and embryos of *E. europaeus*: differences in the breaking of their dormancy by gibberellic acid.]** *C.R. Acad. Sci., Paris* 250 (25), 1960 (4197–9). 4 refs. [F.] O.R.S.

Compares the behaviour of isolated embryos with that of seeds with the tegument removed, when treated with various concentrations of the acid. Further studies will be made on the substances causing the dormancy.

124. CAMEFORT, H. Évolution de l'organisation du cytoplasme dans la cellule centrale et l'oosphère du *Pinus laricio* Poir. (var. *austriaca*). **[Evolution of the organization of the cytoplasm in the central cell and oosphere of *P. nigra* var. *austriaca*.]** *C.R. Acad. Sci., Paris* 250 (22), 1960 (3707–9 + 7 photos). 1 ref. [F.] O.R.S.

Illustrated by electron photomicrographs.

163. Embryology

See also Nos. 122–4, 130.

125. NARAYANASWAMI, S., and ROY, S. K. **Embryology of the genus *Psidium*.** *J. Indian Bot. Soc.* 39 (1), 1960 (35–45). 18 refs. O.B.D.

Deals with *P. guajava* and *P. cujavillus*.

164. Morphology

See also Nos. 119–20, 151, 160, 183, 189, 386.

126. JOHNSON, M. A., and TOLBERT, R. J. **The shoot apex in *Bombax*.** *Bull. Torrey Bot. Cl.* 87 (3), 1960 (173–86). 36 refs. O.B.D.

Describes the structure of the shoot apex in 7 species.

127. RAMJI, M. V. **The structure of the shoot apex and leaf initiation in *Polyalthia longifolia*.** *Proc. Indian Acad. Sci.* 51*B* (5), 1960 (227–41 + 1 plate). 29 refs. O.R.S.

128. BURTON, R. F. **The mathematical relationship between the lengths of lateral nerves and their positions on a leaf.** *New Phytol.* 59 (1), 1960 (48–52). O.R.S.

Presents an equation already successfully applied to leaves or leaflets of 15 species, including *Fagus sylvatica*, *Quercus* spp., *Carpinus betulus*, *Betula* spp., *Castanea sativa*, *Tilia vulgaris*, *Ulmus glabra* and *Aesculus hippocastanum*. Discusses its validity and the possibility of its more general application.

129. SLADE, B. F. **The mode of origin of vein-endings in the leaf of *Liriodendron tulipifera* L.** *New Phytol.* 58 (3), 1959 (299–305 + 1 plate). 6 refs. O.R.S.

130. NAIR, N. C., and SUKAMARAN, N. P. **Floral morphology and embryology of *Brucea amarissima*.** *Bot. Gaz.* 121 (3), 1960 (175–85). 20 refs. O.B.D.

131. HABER, J. M. **The comparative anatomy and morphology of the flowers and inflorescences of the Proteaceae. I. Some Australian taxa.** *Phytomorphology* 9 (4), 1959 (325–58). 57 refs. O.B.D.

Presents the results of a study of 31 species belonging to 18 different genera.

132. SASTRI, R. L. N. **Vascularization of the carpel of *Myristica fragrans*.** *Bot. Gaz.* 121 (2), 1959 (92–5). 8 refs. O.B.D.

133. YAMAZAKI, T., and TAKEOKA, M. **[Electron-microscope investigations on the surface structure of the pollen membrane, based on the carbon replica method. II; III.]** *J. Jap. For. Soc.* 40 (1; 4), 1958 (7–11; 154–9). 8 refs. [Jap.jap.e.]

[Cf. *F.A.* 18 No. 3708.] Describes and illustrates pollen of: (II) *Cephalotaxus drupacea*, *Pinus densiflora*, *Cunninghamia lanceolata*, *Alnus sieboldiana* and *Quercus glauca*; (III) *Tsuga sieboldii*, *Sciadopitys verticillata*, *Chamaecyparis obtusa*, *Liquidambar formosana* and *Sambucus sieboldiana*.

134. HARADA, M. **[Anatomical characteristics of the seed-integument observed on 8 species of Eucalypts.]** *Rep. Kyushu Univ. For.* No. 13, 1959 (33–43 + 2 plates). 5 refs. [Jap.e.]

Describes, with illustrations, the anatomical characteristics of the species studied, viz. *Eucalyptus miniata*, *E. maculata*, *E. coccifera*, *E. diversicolor*, *E. gunnii*, *E. blakelyi*, *E. deglupta*, *E. brockwayi*. [Cf. *F.A.* 20 No. 138.]

165.3/.7. Heredity, Genetics and Breeding; Variation

See also Nos. 191–2, 206–7, 214, 239, 262–3, 269–71, 275, 299, 319, 386–9, 398–401, 448 *et seq.*, 513–4, 543, 733, 916, 966, 1151–2.

135. BINGHAM, R. T. [Editor.] **An annotated directory to Canadian and foreign workers in forest genetics and related fields.** *J. For.* 58 (8), 1960 (602–18).

Presents alphabetical lists of (1) workers, with

addresses and subjects; (2) subjects, with workers interested in each; (3) countries, with workers located therein.

136. **Proceedings of the Fourth Lake States Forest Tree Improvement Conference, Oct. 6–7, 1959.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 81, 1960. pp. 60.

[Cf. *F.A.* 19 No. 3842.] Contains sections on forest tree breeding research in the Lake States, and papers including: Principles of Mendelian genetics applicable in forestry (*E. Steiner*); Applications of population genetics to forest tree breeding (*J. E. Grafius*); Role of introduced species in forest genetics (*S. H. Spurr*); The ecotype concept and forest tree genetics (*H. Nienstaedt*); Individual tree selection in forest genetics (*J. W. Wright*); Species and racial hybridisation in forest genetics (*H. B. Kriebel*).

137. SCHÖNHERR, W. Pflanzenpatente und ihre Bedeutung für die Forstwirtschaft. [**Plant patents and their importance for forestry.**] *Forst- u. Holzw.* 15 (11), 1960 (214–6). [G.]

Outlines the various sections of sub-class 45 d (New Plants) in the German Patents classification. The sub-class covers methods and products of breeding. In all, 38 patents have been granted, two of them referring to tree breeding. These are presented, and discussed in order to show what a plant patent is, how it should be drawn up, and what protection it gives.

138. DEVREUX, M., and MALINGRAUX, C. Pollen de *Elaeis guineensis* Jacq. Recherches sur les méthodes de conservation. [**Methods of storing *E. guineensis* pollen.**] *Bull. agric. Congo belge* 51 (3), 1960 (543–66). [F.f.du.]

Experiments have shown the superiority of cold storage (± 5° C.) over storage at air temperature (37·2–60·3% germination vs. 0·7–18%).

139. FECHNER, G. H., WHALEY, R. S., and ARTMAN, L. R. **Germination of some Rocky Mountain tree pollens after six years of storage.** *Res. Note Colo. Coll. For. Range Mgmt.* No. 12, 1960. pp. [3]. 1 ref.

Results after 3 years of storing pollen at different relative humidities (r.h.) and temperatures were published previously [cf. *F.A.* 19 No. 3840]. After 6 years, pollen stored at 0–4° C. was viable for each species, but that stored at 24–27° C. was not. Germination % was very low for *Pinus contorta* and *P. flexilis* pollen, but reached 35% for (*a*) *P. ponderosa* and 45% for (*b*) *Picea pungens*. Best r.h. was 50% for (*a*) vs. 25% for (*b*). Though no effect of different culture media was noted for (*b*), germination of (*a*) was favoured by a medium with higher sucrose content.

140. MANŽOS, A. M. Žiznesposobnost' pyl'cy sosny pri raznyh sposobah hranenija. [**The viability of Pine pollen under different methods of storage.**] *Trud. Inst. Les.* No. 37, 1958 (171–4). [Russ.]

Pollen of *Pinus sylvestris*, *P. contorta* and *P. banksiana* was stored (*a*) in plugged test-tubes at room temperatures, (*b*) in plugged test-tubes in desiccators in darkness at room temperatures, and (*c*) in test-tubes in desiccators at constant temperatures from − 2 to − 50° C. With (*a*), viability lasted 10–12 days; and with (*b*) and (*c*) for ca. 1 year. Low temperatures for 2 days stimulated subsequent pollen growth, as was indicated mainly by the increased length of the pollen tubes.

141. CHRISTIANSEN, H. **On the effect of low temperature on meiosis and pollen fertility in *Larix decidua* Mill.** *Silvae Genet.* 9 (3), 1960 (72–8). 13 refs. [E.e.g.f.]

Describes the inhibition and resumption of meiosis in *Larix decidua* as a result of low temperature. Irregularities of pollen mother cells and pollen grains occurred, and the resulting pollen was sterile. In refrigeration experiments, the threshold temperature at which inhibition of meiosis took place was found to be + 2° to + 3° C. continuously applied. It seems also that this threshold is 1–2° lower for the final stages of prophase-diakinesis than for the stages metaphase 1 to anaphase 2, and that there is some variation from tree to tree. The mitotic pollen grain divisions were not synchronized, and they were not completed until about a week before the discharge of pollen. If this is a normal occurrence, it limits the period during which male buds can be forced for pollen extraction. *From author's summary.*

142. VIDAKOVIĆ, M. Oplemenjivanje ariša. [**Breeding of Larch.**] *Šum. List* 83 (10/11), 1959 (347–54). 9 refs. [Croat.croat.e.]

Reports on Larch breeding trials in 1957–58, when seed was obtained by artificial pollination and the height growth of the progeny assessed. Best growth was found in *Larix decidua* ♀ × *L. leptolepis* ♂, which already showed heterotic vigour in their first year.

143. MANŽOS, A. M., and POZDNJAKOV, L. K. Triploidnaja forma listvennicy daurskoj v Central'noj Jakutii. [**A triploid form of *Larix gmelinii* in Central Yakutia.**] *Dokl. Akad. Nauk SSSR* 130 (2), 1960 (437–9). 14 refs. [Russ.] A.P.B.

Artificial cross- and self-pollination on a tree of *L. gmelinii* produced seeds with almost identical germination %. Radicles taken from germinating seed derived from the selfed cones showed in all cases the triploid chromosome number of 36. The pollen of the parent tree was very variable in size, ranging from 16 to 96μ, and had a high germinative energy.

144. BOUVAREL, P. Note sur la résistance au froid de quelques provenances de pin maritime. [**The cold-resistance of some provenances of *Pinus pinaster*.**] *Rev. for. franç.* 12 (7), 1960 (495–508). 5 refs. [F.]

A provenance trial has been made at Nancy using *P. pinaster* seed from (*a*) natural, (*b*) naturalized, and (*c*) artificial (i.e. plantation) sources. It is concluded that there are, within the natural area of the species, some more or less frost-resistant ecotypes. The most resistant appear to come from those districts where the winter temperatures are lowest.

145. FUKAREK, P. Nova svojta borova u Bosni (prethodno saopštenje). **[A new race of Pine in Bosnia (preliminary communication).]** *Šum. List* 84 (5/6), 1960 (152–6). [Croat.e.]

The new race, found on Mt. Trebević near Sarajevo, appears to be a hybrid between *Pinus mugo* and *P. heldreichii*, and has been given the provisional name of *P. mugodermis*. It may have originated on the mountain, where both parent species grow, or have been introduced with planting stock.

146. DOBRINOV, I. Za formovoto raznoobrazie pri njakoi iglolistni v gornija pojas na planinskite gori u nas. **[Variations in the form of some coniferous species towards the tree line in Bulgaria.]** *Gorsko Stopanstvo* 13 (10), 1957 (448–53). [Bulg.]

Discusses and illustrates variations in tree and cone form in *Pinus mugo*, *P. sylvestris*, and *P. mugo* × *P. sylvestris*.

147. JURHAR, B. Posebna rasa črnega bora v Slovenskih Alpah. **[A special race of *Pinus nigra* in the Slovenian Alps.]** *Gozd. Vestn.* 18 (6), 1960 (161–71). 6 refs. [Sloven.g.]

The race, locally called *cretovec*, occurs on the N. and N.E. slopes of the Storžič massif and the Kokra valley, where it is distinguished from the ordinary *P. nigra* by its excellent timber. Natural regeneration is good, even on rocky ground, and the tree forms a good avalanche barrier. Crown form varies according to site, and the proportion of heartwood is unusually large. It has been planted on a small scale in recent years.

148. RUBNER, K. Das vertikale Gefälle der Kiefernrassen in Mitteleuropa. **[The altitudinal variation in Scots Pine races in Central Europe.]** *Forst- u. Holzw.* 15 (12), 1960 (229–31). [G.]

A general discussion of the changes in the genotype from high-altitude to low-altitude races.

149. CHING, K. K. **Controlled pollination of Douglas-Fir. A pictorial manual on technique.** *Res. Note Ore. For. Lds. Res. Cent.* No. 40, 1960. pp. 11.

Intended for practising foresters.

150. GEORGIEV, K. H., and GALEVA, M. Za nekoi vidovi kiparisi so vonevropski areal vo gevgeliska okolija. **[Some species of Cypress of non-European origin at Gevgelija.]** *Godišn. Šum. Inst., Skopje* 3 (3), 1958 (151–73). 10 refs. [Maced. maced.f.*f.*]

Concludes from detailed examination of 4 trees planted 30 years before, and thought to be *Cupressus arizonica*, that they are in fact (1) *C. arizonica*, (2) *C. arizonica* × *C. torulosa*, (3) *C. torulosa* × *C. arizonica*, and (4) *C. macnabiana* × *C. arizonica*. Seed from all trees gave only 3–8% germination.

151. HADFIELD, M. **Some cut-leaved trees.** *Quart. J. For.* 54 (3), 1960 (230–9). 8 refs.

Notes the occurrence of abnormal forms of trees in which the leaves are cut into unusual shapes, describes the history of their collection and cultivation, and adduces arguments for classing them as cultivars. The types of abnormality are roughly classified, and some of the forms as found in eleven genera are briefly described.

152. ZAIKINA, I. N. K voprosu o selekcii klenov. **[Selection and breeding of Maples.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (143–53). 18 refs. [Russ.]

Discusses introduction and acclimatization, autumn colouring, and hybridization with a view to finding species suitable for ornamental planting in the Moscow region. *Acer tegmentosum*, *A. mandshuricum*, *A. saccharinum*, *A. rubrum*, *A. ginnala*, *A. barbinerve* and *A. spicatum* are recommended for large-scale use; *A. negundo* is very fast-growing but short-lived; *A. saccharum*, *A. pseudosieboldianum*, *A. campestre* and *A. mono* are suitable for group planting if given shelter; further acclimatization studies need to be made on *A. ukurunduense*, *A. pennsylvanicum*, *A. trautvetteri*, *A. velutinum* and *A. pseudoplatanus*. *A. platanoides*, *A. rubrum*, *A. pseudosieboldianum*, *A. saccharinum* and *A. negundo* have a reddish-violet autumn leaf colouring; selection for good colouring should be made in rainy autumns. In hybridization work, *A. barbinerve* and *A. negundo* should be used as the ♂, and *A. rubrum* as ♂ or ♀ parent.

153. FUKAREK, P., and ČELJO, A. Hibridi između gorskog i planinskog javora (prethodno saopštenje). **[Hybrids between *Acer pseudoplatanus* and *A. heldreichii* (preliminary communication).]** *Šumarstvo* 12 (11/12), 1959 (543–8). 10 refs. [Croat.f.]

Describes, illustrates, and maps a Maple (provisionally named *Acer pseudoheldreichii*) discovered in Bosnia and thought to be a hybrid between *A. pseudoplatanus* and *A. heldreichii*, since it shows morphological characteristics intermediate between the two.

154. GRAVES, A. H. **Some outstanding new Chestnut hybrids.** *Bull. Torrey Bot. Cl.* 87 (3), 1960 (192–204). 18 refs. O.B.D.

As a result of cross-breeding for blight resistance, 3 promising new hybrids have been produced: (1) Essate—Jap. Chestnut [(*Castanea crenata* × *C. pumila*) × *C. crenata*] ♀ × *C. crenata* ♂; (2) Sleeping Giant Chestnut (*C. mollissima*) ♀ × (*C. crenata* × *C. dentata*) ♂; and (3) Kelsey Chestnut, *C. mollissima* ♀ × ? ♂. The trees are self-sterile.

155. GUIMARÃES, R. FOOT, and KERR, W. ESTEVAM. Auto-fecundação em *Eucalyptus alba*. **[Self fertilization in *E. alba*.]** *Boletim, Serviço Florestal Companhia Paulista de Estradas de Ferro, [São Paulo]* No. 11, 1959. pp. 9. 1 ref. [Port.e.]

A flowering branch of a *E. alba* graft was caged and bees were introduced. The cage was kept in place from Jan. 21 to March 7, supplementary food being meanwhile supplied to the bees. A comparison was later made of the number of fruits, seeds and fertile seeds obtained by (1) this method, (2) hand pollination, and (3) open pollination. By (1), 93 fertile seeds were obtained compared with 5 obtained by (2) and 209 by (3).

156. SEKAWIN, M. L'expérimentation en Italie des clones de peuplier sélectionnés par l'Institut d'Expérimentation pour la Populiculture de Casale Monferrato. **[Trials in Italy with selected Poplar clones from the Poplar Research Institute at Casale Monferrato.]** Istituto di Sperimentazione per la Pioppicoltura, Casale Monferrato, Italy. [1959?] pp. 94. [F.] Limited distribution.

Discusses, on the basis of field reports and comparative trials, the nursery and plantation performance of various clones in different parts of N. Italy, with data on the distribution of plants and cuttings and on veneer quality. Includes brief descriptions of 12 clones of *Populus* × *euramericana* and 3 of *P. deltoides*.

157. MARCET, E. Beitrag zur Frühdiagnose von Tief- und Hochlagensorten bei Schwarzpappelhybriden. **[Tests for early selection of Black Poplar hybrids suitable for low or high altitudes.]** *Schweiz. Z. Forstw.* 111 (8), 1960 (428–40). 2 refs. [G.f.]

Five plants each of the following cultivars: (1) a cv. of the *P.* × *serotina* group from Marais Poitevin, Western France, alt. of origin 20 m., (2) one of the *P.* × *regenerata* group from Gièves du Lac near Yverdon (435 m.), and (3), one designated 'Dolomite Poplar' (1300 m.) from Wettstein's collection at Karlsruhe, were grown from cuttings in pots at sites near Zurich at altitudes of 388, 623 and 865 m. respectively. At the end of the second growing season (1) ranked first, in terms of height growth and dry weight of aerial parts, at the lowest site, and third at the highest, while the position for (3) was the reverse. All three cultivars were taller and heavier at the lowest site, but the differences were least for (3). Flushing at the beginning of the second growing season was delayed at the highest site; (3) was the earliest flusher on all sites, and showed least differences due to altitude; (2) occupied throughout an intermediate position. The tests are thought to indicate the existence of climatic races among the cultivars, the known place of origin representing either the actual origin or a place at which the cultivar became established because the climate was suitable.

158. JOVANOVIĆ, B., and TUCOVIĆ, A. Novi hibridi topola dobijeni u 1959 godini. **[New Poplar hybrids obtained in 1959.]** *Šumarstvo* 13 (3/4), 1960 (137–48). 6 refs. [Serb.serb.f.]

Describes first-year growth of 25 hybrids raised in 1959 in the arboretum of the Forestry Faculty, Belgrade, 23 of which were produced by controlled hybridization and 2 by open pollination, using 13 native and 7 introduced Poplars. Attention is drawn to the value of native *Populus nigra* as ♂ parent, and of hybrids of the 'Bachofen' Poplar (*P. tremula* var. *typica* f. *deliblatica* and *P. tremula* var. *villosa* f. *deliblatica*) with other Poplars of the section *Leuce*. [Cf. *F.A.* 20 No. 1470.]

159. SCHÖNBACH, H., and SCHEUMANN, W. Bestimmung der Zellsaftkonzentration von Pappelblättern mit Hilfe des Refraktometers. Ein Beitrag zur Entwicklung von Serienuntersuchungsmethoden für die Selektion dürreresistenter Formen forstlich interessierender Baumarten. Vorläufige Mitteilung. **[Determining the cell-sap concentration of Poplar leaves with a refractometer. Contribution to the development of research methods for selecting drought-resistant forms of forest species. Preliminary report.]** *Züchter* 30 (2), 1960 (83–7). 3 refs. [G.g.] E.M.B.

Presents the results of measurements made on different dates, representing varying temperature and rainfall conditions, in June–July 1959, for samples of leaves of *P. tremula* × *P. tremula*, *P. tremula* × *P. tremuloides*, *P. tremula* × *P. grandidentata* and *P. tremula* × *P. alba*. The parent trees were of different provenances and 15 trees were studied from each population. Considerable variations, both in trends over the test period and in absolute values on any single day, were found between populations. The results suggest that the method can be used to show, rapidly and simply, specific differences in physiological reactions to varying conditions. Further research is needed.

160. JANSON, L. Próba analizy statystycznej cech morfologicznych u mieszańcowego potomstwa topoli przy zastosowaniu metody Wankego. **[Statistical analysis of the morphological characters of Poplar hybrid progeny by Wanke's method.]** *Prace Inst. Bad. Leśn.* No. 195, 1960 (3–29). 2 refs. [Pol.russ.e.]

[Cf. *F.A.* 21 No. 4068.] An account of the use of the method of multiple stochastic correlation for analysing characteristics (e.g. foliage type, habit, branching, formation of terminal bud, shoot pubescence) of populations of *Populus canescens* × *P. bolleana* and *P. canescens* × *P. alba*.

161. MANŽOS, A. M. Bystrorastuščaja forma *Populus balsamifera* L., polučennaja ot opylenija ženskih cvetkov *Populus balsamifera* L. frakcionirovannoj pyl'coj ėtogo vida. **[Fast-growing form of *P. balsamifera* obtained by pollinating female flowers with fractionated pollen of the same species.]** *Dokl. Akad. Nauk SSSR* 131 (2), 1960 (433–5). 8 refs. [Russ.] A.P.B.

Crossings were made in the laboratory and in the field, using pollen graded into 4 size fractions. Among the seeds obtained from pollination with the heaviest fraction, some gave seedlings with retarded growth, but there were 7 that produced fast-growing seedlings. Two of these were examined and proved to be triploids, with a somatic chromosome number of 57. At 2 years, these triploids were 145–200 cm. tall, compared with the 60–80 cm. of plants from the other variants in the experiment.

162. ISLAM, A. S. **Unproductivity in the colchicine-induced tetraploids of *Annona squamosa* L.** *Nature, Lond.* 187 (4734), 1960 (343–4). 2 refs.

Only two out of a large number of colchicine-treated plants of *A. squamosa* proved to be pure tetraploid on chromosome examination. These have been under observation since 1951, but until now neither of them has borne any fruit, though they flower every year. [Cf. *F.A.* 8 No. 908.]

163. BUIJTENEN, J. P. VAN, and EINSPAHR, D. W. **Note on the presence of sex chromosomes in *Populus tremuloides*.** *Bot. Gaz.* 121 (1), 1959 (60–1). 8 refs. O.B.D.

Of 28 staminate individuals of *P. tremuloides*, 6

were found to have a heteromorphic chromosome pair, but a heteromorphic condition was not found in the others. It is unlikely, therefore, that the ♂ sex in *P. tremuloides* is determined in this way.

164. SANTAMOUR, F. S., JR. **New chromosome counts in *Pinus* and *Picea*.** *Silvae Genet.* 9 (3), 1960 (87–8). 11 refs. [E.]

In addition to confirmation of published data, the following new chromosome numbers were found: $n = 12$ for *Pinus armandii*, *P. ayacahuite*, *P. cembra*, *P. edulis*, *P. griffithii*. *P. koraiensis* and *P. monticola*, *Picea asperata*, *P. balfouriana*, *P. bicolor*, *P. engelmannii*, *P. jezoensis* var. *hondoensis*, *P. koyamai*, *P. maximowiczii*, *P. montigena*, *P. omorika*, *P. orientalis* and *P. rubens*.

168. Histology

See also Nos. 126–7, 129–32, 134, 450, 453–4, 784, 957 *et seq.*, 1011.

165. TULECKE, W. **Arginine-requiring strains of tissue obtained from *Ginkgo* pollen.** *Plant Physiol.* 35 (1), 1960 (19–24). 16 refs. O.R.E.

Strains of tissue (regarded as biochemical mutants selected from large populations of cultured pollen) may be isolated from pollen grown on a synthetic medium containing arginine. [Cf. *F.A.* 16 No. 3805.]

166. TOROK, D. DE, and WHITE, P. R. **Cytological instability in tumors of *Picea glauca*.** *Science* 131 (3402), 1960 (730–2). 16 refs. O.R.S.

[Cf. *F.A.* 17 No. 3657.] Presents the results of a cytological study of 1000 somatic nuclei from dividing callus cells, 320 from cultures of normal wood, 680 from tumour wood. Mitotic behaviour was completely regular in the normal cells, the great majority of the cells being diploid (22 chromosomes), a few tetraploid, and scarcely any aneuploid. In the tumour tissue, a high % of the mitoses were aneuploid, and chromosome numbers of the mitoses ranged from 3 to uncountable complexes of more than 70. There is a marked difference between the extreme cytological instability of tumour wood and the high degree of uniformity of adjacent normal tissue. The results are compared with data from other plant tumours.

167. KHALIL, H. AL-T., and TORREY, J. G. **The aseptic culture of isolated buds of *Pseudotsuga taxifolia*.** *Plant Physiol.* 34 (6), 1959 (630–7). 24 refs. O.R.E.

A technique was developed for sterilizing a bud taken during the winter rest period and for culturing it on an agar nutrient medium. Such isolated buds required available O, a C and energy source such as one of the simple sugars, and the mineral elements of the nutrient medium. Buds failed to develop without light, but developed well in a nutrient medium under white fluorescent light. Added auxins at $10^{-6}M$ had no stimulatory effect on bud or leaf expansion, and higher concentrations inhibited bud development and stimulated callus tissue proliferation. Gibberellic acid stimulated axial elongation of the bud, but always caused death at the concentrations tested (0·1 and 10 mg./litre). Of a number of organic substances tested, only urea had a beneficial effect on bud development. *From authors' summary.*

168. CATESSON, A.-M. Caractères cytologiques de l'apex et des cordons proconducteurs naissants d'*Acer pseudoplatanus* hors de la reprise d'activité printanière. **[Cytological characters of the apex and the developing procambial strands of *A. pseudoplatanus* at the beginning of spring growth.]** *C.R. Acad. Sci., Paris* 250 (13), 1960 (2418–20). 1 ref. [F.f.] O.R.S. [Cf. *F.A.* 21 No. 2784.]

169. CHARDENON, J., and TARIS, B. Recherches sur la reprise de l'activité du cambium de cultivars de *Populus*, cultivé *in vitro*. **[Studies on the resumption of growth by cambium of *Populus* cultivars grown *in vitro*.]** *C.R. Acad. Sci., Paris* 251 (1), 1960 (120–1). [F.] O.R.S.

Results (tabulated) of studies on cambial tissue of 3 cultivars of *P.* × *canadensis* and one of *P. deltoides* showed that in favourable conditions the resumption of cambial growth is independent of season. Proliferation was most pronounced in May–June and October–November. Some difference between the cultivars was found.

17. Systematic Botany

See also Nos. 128, 160.

172.8. Eumycetes (True Fungi)

See also Nos. 48–9, 706 *et seq.*, 1095 *et seq.*

170. CUNNINGHAM, G. H. **Hydnaceae of New Zealand. Part I—The pileate genera *Beenakia*, *Dentinum*, *Hericium*, *Hydnum*, *Phellodon* and *Steccherinum*. Part II—The genus *Odontia*.** *Trans. Roy. Soc. N.Z.* 85 (4), 1958 (585–601); 86 (1/2), 1959 (65–103). 9 refs. O.R.S.

171. COOKE, W. B. **The genera of pore fungi.** *Lloydia* 22 (3), 1959 (163–207). 3 pp. of refs. P.R.

Species of fungi with pores, or pore-like structures in which the hymenium is produced, have been assigned to ca. 300 genera. The names of these genera are listed in alphabetical order, indicating the species on which they were, or are thought to have been, based, and the validity of their use in connexion with species or groups of species. Ca. 100 are considered valid. Erection of new genera to replace invalid ones is not attempted.

172. MOREAU, C., and MOREAU, M. Champignons foliicoles de Guinée. I. Ascomycètes à organisation fruste. . **[Leaf fungi of Guinea. II. Ascomycetes of limited organization.]** *Rev. Mycol., Paris* 24 (4), 1959 (349–59). 2 refs. [F.] I.M.I.

Describes 3 new species of *Plectomyriangium* and a new species of *Gymnoascopsis*.

173. ARX, J. A. VON. Über die Ascomycetengattung *Plochmopeltis* Theiss. **[The Ascomycete genus *Plochmopeltis*.]** *Meded. Phytopath. Lab. Scholten* No. 30, [1959]. pp. 5. 6 refs. [G.g.e.]

Describes the type species *P. intricata* found on *Quercus laurifolia* and *Q. virginiana* var. *virescens*, and *P. ellisii* sp. nov. on *Olea americana*.

174. MATHIESEN-KÄÄRIK, A. **Studies on the ecology, taxonomy and physiology of Swedish insect-associated blue stain fungi, especially the genus *Ceratocystis*.** *Oikos* 11 (1), 1960 (1–25). 69 refs. [E.]

Summarizes the results of investigations up to 1960. [Cf. *F.A.* 15 No. 1963; 18 No. 131.]

175. JURZITZA, G. Physiologische Untersuchungen an Cerambycidensymbionten. Ein Beitrag zur Kenntnis der Symbiose holzfressender Insektenarten. **[Physiological studies on symbionts of Cerambycidae. A contribution to the study of symbiosis in wood-boring insects.]** *Archiv für Mikrobiologie, Berlin* 33 (4), 1959 (305–32). 61 refs. [G.g.] O.R.S.

Presents results of studies in culture of symbiotic fungi (all those isolated were *Candida* spp.) from *Rhagium mordax*, *R. inquisitor* and *Leptura rubra*.

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

See also Nos. 219–20.

176. CLAPHAM, A. R., TUTIN, T. G., and WARBURG, E. F. **Flora of the British Isles. Illustrations. Part II. Rosaceae—Polemoniaceae.** Drawings by S. J. Roles. University Press, Cambridge. 1960. pp. v + 119. Price 25*s*. [Cf. *F.A.* 13 No. 2794.]

177. CIRIMOTIĆ, J. Prilog poznavanju flore planine Duba kod Dojranskog Jezera. **[A contribution to the knowledge of the flora of the Dub mountains near Lake Dojran.]** *Godišn. Šum. Inst., Skopje* 3 (3), 1958 (175–210). 8 refs. [Serb.g.]

Presents a list of 475 species (68 families), compiled in 1957 during a study of forest plant associations over an area of ca. 6000 ha. The habitat of each plant is noted (the associations within the area are the *Chrysopogetum grylli* and 4 subdivisions of *Carpinetum orientalis*).

178. YATOH, K.-I. **[Study on the forest botany of the Kii peninsula.]** Mie University, Tsu. [1960.] [Jap.e.]

Comprises [separately paginated]: a paper in Japanese with the above title (*Repr.* from *Bulletin, Faculty of Agriculture, Mie University* No. 19 (39–47)) with its English summary (*Repr.* from *Bulletin, Mie University Forests* No. 4, 1960 (91–100)), and Materials for the botanical study of the forest flora of the Kii Peninsula I–V [see *F.A.* 20 Nos. 2979–80].

179. **A.E.T.F.A.T.—index 1959: index of papers on systematic phanerogamy and of the new taxa concerning Africa south of the Sahara and Madagascar.** Association pour l'Étude Taxonomique de la Flore d'Afrique Tropicale, Brussels. 1960. pp. 55. [F.E.] [Cf. *F.A.* 20 No. 4200.]

180. WOODSON, R. E., JR., *et al.* **Flora of Panama. Part IV, Fascicle 2. Chloranthaceae, Lacistemaceae, Salicaceae, Myricaceae, Juglandaceae, Corylaceae, Fagaceae, Ulmaceae, Moraceae, Urticaceae, Proteaceae.** *Ann. Mo. Bot. Gdn.* 47 (2), 1960 (81–203). O.B.D.

181. GUDEX, M. C. **Native flora of Maungakawa-Te Miro (Waikato).** *Trans. Roy. Soc. N.Z.* 87 (1/2), 1959 (5–8). O.R.S.

A list by families of the flora of this area 5–8 miles N.E. of Cambridge, New Zealand. Much of the area, apparently formerly subtropical rain forest, has now become farm land. The influence of farm animals, fallow deer and opossums has been considerable in the remaining wooded areas.

174.2/.7. Gymnosperms

See Nos. 145–6, 150, 164, 386, 975.

176.1. Dicotyledons

See also Nos. 131, 134, 151, 153, 160.

182. LAIDLAW, W. B. R. **Guide to British hardwoods.** Leonard Hill (Books) Ltd., London, N.W.1. 1960. pp. xii + 240. 27 refs. Price 30*s*.

Contains: an elementary study of anatomy, physiology, growth, reproduction and morphology; 3 keys based on winter twigs, summer characters, and fruits; tabulated data on general field characters and seasonal history; synopsis of families, systematic list of species, and descriptions of the species, illustrated by line drawings; bibliography, glossary, systematic index and index of common names. Species covered include all native species (with the exception of a few climbers and woody shrubs) plus familiar and certain less familiar exotics.

183. WYATT-SMITH, J. **Field key to the trees of Mangrove forests in Malaya.** *Malay. Forester* 23 (2), 1960 (126–32).

Includes (1) a field key to all Mangrove trees, (2) supplementary notes on their leaves, and (3) notes on the seedlings of the important genera *Bruguiera* and *Rhizophora*.

184. STEENIS, C. G. G. J. VAN. **Miscellaneous botanical notes X.** *Blumea* 10 (1), 1960 (136–41). [E.] O.R.S.

Includes descriptions of the three new Malaysian species, *Kopsia mitrephora*, *K. lapidilecta*, and *K. tenuis*.

185. SULOCHANA, C. B. **Indian species of *Rauvolfia*.** *J. Indian Bot. Soc.* 38 (4), 1959 (575–94 + 3 plates). 16 refs. O.B.D.

Distribution, taxonomy, morphology, and wood anatomy of 5 species.

186. VASIL'EV, V. N. Bajkalo-Sajanskaja oblast' kak odin iz glavnejših pozdnih centrov formirovanija roda *Betula* L. **[The Baikal-Sayan region as one of the most important recent centres in the formation of the genus *Betula*.]** *Trud. Inst. Les.* No. 37, 1958 (120–41). 10 refs. [Russ.russ.]

Gives Russian and Latin descriptions of *B. henriettae*, *B. pseudomiddendorffii*, *B. vladimirii*, *B. tinlinae*, *B. transbaicalensis*, *B. sajanensis*, *B. pseudopendula*, and *B. jacutica* (all spp. nov.) and Russian descriptions of *B. baicalensis* and *B. montana*. Also discusses the taxonomic and morphological relationships between these and other *Betula* spp.

187. CUATRECASAS, J. **Studies on Andean Compositae—IV.** *Brittonia, N.Y.* 12 (3), 1960 (182–95). Many refs.

Includes descriptions of *Gynoxys carpishensis* sp. nov., a tree 12 m. high, from cloud forest in Peru, and *G. sancti-antonii* var. *latifolia* var. nov., a shrub or tree up to 4·5 m. high, from high altitudes in Ecuador.

188. **Posthumous publication of new Dipterocarp species from North Borneo.** *Gdns' Bull.* 17 (3), 1960 (486–97).

Descriptions and drawings of 5 new species: *Dipterocarpus exalatus* van Slooten, *Shorea argentifolia* Sym., *Shorea superba* Sym., *Shorea symingtonii* Wood, and *Hopea pentanervia* Sym. ex Wood.

189. POOLE, A. L. **Studies of New Zealand *Nothofagus* species. III—The entire-leaved species.** *Trans. Roy. Soc. N.Z.* 85 (4), 1958 (551–64). 4 refs. O.R.S.

A statistical study of leaf characters in populations throughout the range of *N. solandri* and *N. cliffortioides*, undertaken to clarify their taxonomic relations, revealed a transition in most characters. The evidence was sufficiently conclusive to justify making one species (*N. solandri*) of the complete range, and retaining the originally described species as varieties.

190. MARTÍNEZ, M. Los encinos de México. XII. **[The Oaks of Mexico. XII.]** *An. Inst. Biol. Univ. Méx.* 30 (1/2), 1959 (63–83). [Span.] C.G.B. [Cf. *F.A.* 21 No. 170.]

191. TUCKER, J. M., and HASKELL, H. S. ***Quercus dunnii* and *Q. chrysolepis* in Arizona.** *Brittonia, N.Y.* 12 (3), 1960 (196–219). 30 refs.

Taxonomic and nomenclatural history, distribution and ecology, morphological studies (differences between the two species; population samples), and discussion, especially of hybrid intermediates, introgression, and inferences from related fossil species.

192. FORDE, N., and ISING, E. H. ***Acacia calcicola*, a new species of importance to the ecology of the Australian arid zone.** *Transactions of the Royal Society of South Australia, Adelaide* 81, 1958 (153–60 + 2 plates). I.I.E.

Notes on morphology, distribution and habitat of this species, with a key. *A. calcicola* is widespread in the arid zone of Australia, where it commonly forms the tree layer in an open woodland formation on soils with subterranean or exposed secondary limestone.

193. DEVRED, R., and BAMPS, P. Un nouveau *Monopetalanthus* au Congo Belge (Caesalpiniaceae). **[A new species of *Monopetalanthus* from the Belgian Congo.]** *Bull. Jard. Bot. Brux.* 30 (1), 1960 (111–4). 2 refs. [F.] O.B.D.

Describes *M. leonardii* sp. nov. with a key to the *Monopetalanthus* species of the Congo.

194. ROBYNS, W. Une espèce nouvelle d'*Ocotea* (Lauraceae) du Kenya. **[A new species of *Ocotea* from Kenya.]** *Bull. Jard. Bot. Brux.* 30 (1), 1960 (1–4). [F.] O.B.D.

Presents a description of the new species, *Ocotea argylei*, followed by a synopsis of the *Ocotea* species of tropical Africa.

195. LEROY, J. F. Recherches sur les Meliaceae: un intéressant genre de Turraeeae, le *Caledocaryia* J. F. Ler. (deux espèces), endémique à Madagascar. **[Studies on the Meliaceae: *Caledocaryia* (two species), an interesting genus of the Turraeeae endemic in Madagascar.]** *C.R. Acad. Sci., Paris* 250 (24), 1960 (4026–8). [F.] O.R.S.

Describes the flower and gives taxonomic descriptions of *Caledocaryia* gen. nov. and *C. pauciflora* and *C. crassifolia* spp. nov.

196. CORNER, E. J. H. **Taxonomic notes on *Ficus* Linn., Asia and Australasia. I. Subgen. *Urostigma* (Gasp.) Miq. II. Subgen. *Pharmacosycea* Miq. III. Subgen. *Ficus* and sect. *Ficus*. IV. Subgen. *Ficus* sect. *Sycidium* Miq.** *Gdns' Bull.* 17 (3), 1960 (368–485).

A revision of the Asian and Australasian species.

197. JARRETT, F. M. **Studies in *Artocarpus* and allied genera, V. A revision of *Parartocarpus* and *Hullettia*.** *J. Arnold Arbor.* 41 (3), 1960 (320–40).

[Cf. *F.A.* 21 No. 4110.] Describes two species each of *Parartocarpus* (including 4 subspp. of *P. venenosus*) and *Hullettia*.

198. WILSON, K. A. **The genera of Myrtaceae in the southeastern United States.** *J. Arnold Arbor.* 41 (3), 1960 (270–8). 47 refs.

Presents descriptions and a key to 7 genera, with brief comments on the most important species found in this region.

199. **Bibliography of *Eucalyptus* [in the Mediterranean region].** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU*/60–5, 1960. pp. 5 + 11 + 2. [E.] Limited distribution.

Covers the years 1958–1959.

200. PHILIPPIS, A. DE. **Instructions for the preparation of the herbarium of Eucalypts from the Mediterranean basin.** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU*/60–14, 1960. pp. 4 + 1 drawing. [E.] Limited distribution. Also available in French and Spanish.

The herbarium is to be at the Centro di Sperimentazione Agricola e Forestale at Rome.

201. GOES, E. Os eucaliptos em Portugal. I Volume. Identificação e monografia de 90 espécies. **[Eucalypts in Portugal. Volume I. Identification and monographs of 90 species.]** Direcção Geral dos Serviços Florestais e Aquícolas, Secretaria de Estado da Agricultura, Lisbon. 1960. pp. 298 + 92 plates + 1 tbl. 110 refs. [Port.]

In two parts: (1) Morphological characters of Eucalypts known to be growing in Portugal, with a key to the species. (2) Information on synonyms, common names and distribution, followed by illustrated accounts of 90 species cultivated in Portugal, giving botanical description, natural distribution; area of cultivation in Portugal and utilization.

202. MOGGI, G. Clé analytique pour l'identification des *Eucalyptus* cultivés en Italie. **[Analytical key for the identification of the Eucalypts grown in Italy.]** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/60-3f.* 1, 1960, pp. 6. [F.] Limited distribution.

203. GARDNER, C. A. **Trees of Western Australia. 63—Yellow Tingle; 64—Weeping Gum; 65—Kingsmill's Mallee; 66—Hopetoun Mallee; 67—Capped Mallee; 68—*Eucalyptus carnabyi*; 69—Tallerack; 70—*Eucalyptus micranthera*.** *Repr.* from *Journal of Agriculture of Western Australia, Perth* (*Ser. 4*) 1 (5), 1960 (3–13).

Descriptions, and brief notes on the distribution, of *Eucalyptus guilfoylei, E. sepulcralis, E. kingsmillii, E. leptocalyx, E. pileata, E. carnabyi* and *E. micranthera.*

204. STEENIS, C. G. G. J. VAN. ***Phellodendron*, a genus of trees new to the Malayan flora (Rutaceae).** *Gdns' Bull.* 17 (3), 1960 (357–60).

Describes and illustrates *Phellodendron burkillii* sp. nov.

205. KOLTAY, G. Clasificación botánica de los álamos. **[Botanical classification of Poplars.]** *Silvicultura, Uruguay* 8 (10), 1958 (6–44 + 1 tbl.). [Span.e.]

A Spanish translation of the first chapter in the author's book "A Nyarfa" [cf. *F.A.* 15 No. 3321].

206. MÜLLER, R. Altstammsorten der Schwarzpappelbastarde. (IIr). Die 'Serotina'-Pappel. **['Old stock varieties' of Black Poplar hybrids (IIr). The 'Serotina' Poplar.]** *Holz-Zbl.* 86 (91), 1960 (1283–4, 1286). 15 refs. [G.]

In discussing the history and nomenclature of this variety, thought to be the oldest, particular attention is given to the frequent application to it of the name *Populus monilifera* and the possibility of its being a natural American variety rather than a hybrid. Some of the clones studied had been going under the names "lloydii', 'eugenei', 'regenerata' and 'Bombastus'. Because of its slow juvenile growth, and susceptibility to rusts and *Dothichiza populea*, the cultivation of this once very widely grown Poplar has now almost ceased.

207. MÜLLER, R. Altstammsorten der Schwarzpappelbastarde (IIs). Die Pappel 'Regenerata Deutschland' = 'Harffer Pappel'. **['Old stock varieties' of Black Poplar hybrids (IIs). The 'Regenerata Deutschland' or 'Harff Poplar'.]** *Holz-Zbl.* 86 (98), 1960 (1369–70). 23 refs. [G.]

This variety [cf. *F.A.* 20 No. 1630], propagated for many years by the Harff nurseries near Cologne, is not identical with the Western *P.* × *regenerata* [cf. *F.A.* 21 No. 1511]. Its origins are obscure. In Germany, old trees are found in the Rhine Valley and also in the Allgäu region of S. Württemberg. It is very popular, being resistant to canker, reasonably resistant to rust and *Dothichiza populea*, of good habit and stem form, with satisfactory wood properties, and combining adequate, though not rapid, early growth with good growth in later years. It is reported to be susceptible to drought.

208. ROYEN, P. VAN. **Revision of the Sapotaceae of the Malaysian area in a wider sense. XX. *Madhuca* Gmelin. XXI. *Eberhardtia* Lecomte. XXII. *Mastichodendron* Cronquist.** *Blumea* 10 (1), 1960 (1–125). Many refs. [E.] O.R.S.

(XX) Describes 85 species, with keys, including the new species *Madhuca borneensis, M. spectabilis, M. sessiliflora, M. woodii, M. eriobrachyon, M. sepilokensis, M. sandakanensis, M. montana, M. palustris*, and *M. calcicola*, the doubtful species *M. lanceolata* and the new combinations *M. obtusifolia, M. rufa, M. vulcanica*, and *M. diplostemon*, and lists excluded species. (XXI) Gives a key to and describes *Eberhardtia tonkinensis, E. krempfii* and *E. aurata.* (XXII) *Mastichodendron wightianum* comb. nov.

209. VEKEN, P. VAN DER. *Nothospondias* Engl. Simaroubacée africaine méconnue. **[*Nothospondias* Engl., a misunderstood genus of the African Simarubaceae.]** *Bull. Jard. Bot. Brux.* 30 (1), 1960 (105–9). 6 refs. [F.] O.B.D.

Redescribes the genus and its single species, *N. staudtii*, and discusses their systematic position.

18. Plant Ecology

210. ČOLIĆ, D. B. Teoriski i praktičan značaj proučavanja ekologije Pančićeve omorike. **[The theoretical and practical importance of study of the ecology of *Picea omorika*.]** *Šumarstvo* 13 (1/2), 1960 (104–8). 87 refs. [Serb.]

Reviews work published on *P. omorika* since its discovery was made known in 1876. The references are arranged alphabetically.

211. ZELLER, W. Étude phytosociologique du chêne-liège en Catalogne. **[A phytosociological study of *Quercus suber* in Catalonia.]** *Repr.* from *Pirineos, Zaragoza* No. 47/50, 1959 (1–193 + 38 tbls.). 120 refs. [F.f.span.e.g.] (*Promotionsarbeit, Eidgenössische Technische Hochschule, Zürich* No. 2812.)

Includes a detailed study of the soils, soil/vegetation relations, and plant associations, silvicultural characters and distribution of the species. It is concluded that *Q. suber* is indigenous in Catalonia.

212. GIMINGHAM, C. H. **Biological flora of the British Isles. *Calluna* Salisb. A monotypic genus. *Calluna vulgaris* (L.) Hull.** *J. Ecol.* 48 (2), 1960 (455–83). 145 refs.

Covers distribution; habitat; plant communities (broadly divided into communities of montane heaths and bogs and communities of the 'forest zone'); response to biotic factors; biology and morphology; animal feeders or parasites and plant parasites; and history.

181. Mode of Life, Autecology. Silvicultural Characters of Trees

See also Nos. 191, 303, 313, 350, 537, 555.

213. HORVAT, A. Osvrt na istraživanja crnog bora (*Pinus nigra* Arn.) i njihova primjena u šumarstvu. **[A review of research on *P. nigra* and its use in forestry.]** *Šum. List* 84 (1/2), 1960 (7–20). 46 refs. [Croat.e.]

Thirty-four of the references are to Jugoslavian sources.

214. GÖHRE, K. [Editor]. Die Douglasie und ihr Holz. **[Douglas Fir and its wood.]** Akademie-Verlag, Berlin. 1958. pp. 13 + 596 + 2 tbls., 1 map, 23 plates. 17 pp. of refs. [G.] Price [£6. 17*s*. 6*d*.]

A comprehensive monograph, though referring specially to German conditions and literature, with sections by: *W. Flöhr* on natural range, distribution elsewhere, varieties, and the effect of site on the yield of the *viridis* form in N. Germany in pure and mixed stands; *E. Hengst* on yield studies in S.E. Germany; *E. Wagenknecht* on silviculture; *H. Schönbach* on breeding; *H. Lyr* on diseases; *W. Krüel* and *G. Teucher* on pests; and *K. Göhre* on wood (anatomy, chemical, physical and strength properties, drying, preservation, and uses).

215. HOFFMANN, E. Der Ahorn, Wald-, Park- und Strassenbaum. **[The Maple as a forest, park, and roadside tree.]** Deutscher Landwirtschaftsverlag, Berlin. 1960. pp. 190 + 2 tbls. 65 refs. [G.]

Covers past and present distribution of *Acer* spp., silvicultural characters and requirements, propagation and tending, uses in mixtures in the forest, uses outside the forest, diseases, damage by animals, anatomy and properties and uses of the wood, assortments, prices, etc.

216. MERENDI, A. Le quercie italiane. **[The Italian Oaks.]** *Ital. agric.* 97 (6), 1960 (597–616). [It.] E.M.B.

Notes on distribution, silvicultural characters, and uses of *Quercus robur*, *Q. sessiliflora*, *Q. pubescens*, *Q. conferta*, *Q. cerris*, *Q. trojana*, *Q. aegilops*, *Q. suber*, and *Q. ilex*.

217. NORMAND, D., SALLENAVE, P., and ROTHE, P. L. Les ébènes dans le monde. **[The Ebonies throughout the world.]** *Bois For. Trop.* No. 72, 1960 (15–22). 10 refs. [F.]

Silvicultural characters, distribution, and wood properties of *Dalbergia melanoxylon*, and a number of *Diospyros* spp.

218. VIART, M. ***Khaya senegalensis* Juss.** *Indian For.* 86 (7), 1960 (395–400 + 2 photos, 1 map). 9 refs.

Describes the natural range, climatic and other requirements, silviculture, and apparently successful introduction of *K. senegalensis* at Poona (from seed obtained from Uganda in 1941 and 1947) and Pondicherry (trees of unknown age, the tallest having a girth of 142 in.).

181.1. Distribution, Natural Range

See also No. 282.

219. MIRANDA, F. Posible significación del porcentaje de géneros bicontinentales en América tropical. (Afinidades de la flora arbórea de regiones húmedas del sureste de México). **[Possible significance of the percentage of bicontinental genera in tropical America. (Affinities of the tree flora of the humid regions of southeastern Mexico.)]** *An. Inst. Biol. Univ. Méx.* 30 (1/2), 1959 (117–50). 33 refs. [Span.e.] C.G.B.

The study was made in S.E. Mexico, and the following data are discussed from the point of view of the evolution of the flora: (1) % of 'bicontinental' tree genera (i.e. those occurring outside as well as within the American continent); (2) differences in % of the continental and bicontinental genera when a local association is compared with the regional formation of which it is part; (3) % of tree genera from various regions outside Mexico that are also found in S.E. Mexico; (4) relationships between the number of bicontinental genera found in Asia and America and the number of those found in Africa and America.

220. BURBRIDGE, N. T. **The phytogeography of the Australian region.** *Aust. J. Bot.* 8 (2), 1960 (75–211). 162 refs. O.B.D.

Presents a floral analysis of Australia and Tasmania and discusses the flora in relation to geological history, geographical affinities and probable migration routes.

221. SPIRCHEZ, Z. O staţiune naturală de *Picea excelsa* var. *columnaris* Carrière în Munţii Apuseni la Stina de Vale. **[A natural occurrence of *P. abies* var. *columnaris* at Stina de Vale in the Apuseni Mountains.]** *Rev. Pădurilor* 75 (6), 1960 (367). [Rum.]

222. TOŠIĆ, M. Nova nalazišta munike (*Pinus heldreichii* Christ.) u Srbiji. **[New localities for *P. heldreichii* in Serbia.]** *Šumarstvo* 12 (9/10), 1959 (485–90). 8 refs. [Serb.f.]

A total of 87 trees have been found in the Sjenica area, the remains of forest destroyed by man for resin and fuel. Previously only one natural site for *P. heldreichii* was known in Serbia.

223. CLARKSON, R. B. **Notes on the distribution of *Alnus crispa* in eastern North America.** *Castanea* 25 (2), 1960 (83–5).

Records of the occurrence of *A. crispa* in W. Virginia are doubtful, and this species appears to be absent between Vermont and the outlying station on Roan Mt. (Tennessee and N. Carolina).

224. ŠAHOV, G. N. O svjazi geografičeskogo rasprostranenija duba i ego sputnikov s veličinoj summarnogo isparenija na territorii Evropejskoj časti SSSR. **[The geographical distribution of Oak and its associates in relation to total evaporation in European Russia.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (123–9). [Russ.]

Shows on maps the close relation between evaporation isolines (300 and 350 mm.) and the limits of Oak, Ash, Lime and *Acer platanoides* distribution.

225. ZUBAREV, V. M. Dub čereščatyj na severnyh predelah ego rasprostranenii. **[*Quercus robur* at the northern limits of its range.]** *Soobšč. Inst. Les.* No. 9, 1958 (18–32). 33 refs. [Russ.]

An ecological study of Oak in natural conditions on the flood-plains of the Vyatka and Kama rivers and also in the W. Pre-Urals (Sverdlovsk province). It is concluded that Oak, which formerly covered a far greater area in the north, was replaced by Spruce when a colder climate led to podzolization, but survived on carbonate soils on unpodzolized watersheds or alluvial flood-plain soils. Oak plantations

appear to grow well on sites beyond the N. limit of the natural range of the species, and the establishment of further plantations in these areas is recommended.

226. Carta da distribuição do sobreiro em Portugal. 1. **[Map showing the distribution of Cork Oak in Portugal. 1.]** Direcção Geral dos Serviços Florestais e Aqüícolas, Lisbon. 1960. 1 sheet. Scale 1: 250,000. [Port.]

181.2. Atmospheric Relations. Acclimatization

See also Nos. 6, 101–2, 110, 113–7, 144, 274, 354 *et seq.*, 416, 445, 649–54, 663, 885.

227. SÉBASTIEN, C., and BAGNOULS, F. Conditions climatiques du genévrier de Phénicie et du genévrier thurifère au Maroc. **[Climatic conditions of *Juniperus phoenicea* and *J. thurifera* in Morocco.]** *Bulletin de la Société des Sciences Naturelles et Physiques du Maroc, Rabat* 39 (2), 1959 (41–58). 4 refs. [F.f.]

Climatic data from a number of sites show that *J. phoenicea* grows, in Morocco, in all types of Mediterranean climate from meso-mediterranean to subdesert. *J. thurifera* is a xerothermic mountain species, occurring at altitudes of 2000–3000 m.

228. KISS, L. A fenyöfélék fagyállósága és visszaszerzö képessége. **[The frost resistance and capacity for recovery of conifers in the Botanic Garden at Sopron with reference to the severe winter of 1955–56.]** *Erdészettud. Közl., Sopron* 1959 (1), (59–80). 3 refs. [Hu.russ.g.f.]

229. KASIMOV, V. D. Ustojčivost' elovogo samoseva protiv nizkih temperatur. **[Resistance of Spruce natural regeneration to low temperatures.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (25–9). [Russ.]

In a season when active tree growth began ca. 25 April, Spruce seedlings and advance growth (a.g.) were dug up with their root-ball on 27 May from the *Piceetum oxalidosum* near Moscow, and put into cold chambers: (*a*) −1·5 to −3° C.; (*b*) −3·5 to −6°; (*c*) −10°; (*d*) −15°. Variants (*a*)–(*c*) were applied for 5, 8·5 and 24 hr. each, and (*d*) only for 5 hours. With (*a*), no mortality occurred, and even after 24 hr. exposure only partial damage was caused to the aerial parts of the seedlings. With (*b*), seedling mortality occurred (11·1%) only with the 24-hr. exposure, while the a.g. was only partially damaged. With (*c*), after 5 hr. exposure, seedling mortality was 20% and a.g. mortality 15; after 24 hr., seedling mortality was 100% and a.g. mortality 80. Even with (*d*), 21% of seedlings survived after 5 hr. exposure.

230. PARKER, J. **Seasonal changes in White Pine leaves: a comparison of cold resistance and free-sugar fluctuations.** *Bot. Gaz.* 121 (1), 1959 (46–50). 18 refs. O.B.D.

Needles of *Pinus strobus* trees in Connecticut were sampled for cold resistance throughout the autumn and winter. They increased in hardiness in autumn by stages, apparently partially controlled by low (daily minimum) temperatures. Different trees in the same habitat hardened at somewhat different rates from one another. In a more open habitat the trees hardened more rapidly than those in a sheltered position. By December all were resistant to at least −78° C. In late winter, needles were resistant to at least −196°, provided that the rate of cooling and warming was less than 10° change per hour. Needles in both habitats lost their hardiness in spring relatively rapidly, passing from full winter hardiness to nearly the summer condition in a single week. Raffinose increased from undetectable amounts in autumn to ca. 1·5% of the fresh weight in winter. The decline in spring was relatively steep. Fructose and galactose did not show such a clear relationship to changes in hardiness, but concentrations were somewhat higher in winter than in spring or autumn. Sucrose retained a high level in spring. The water content of leaves did not change appreciably from February to late April.

231. ASSMANN, E. Form und Zuwachsveränderungen von Nadelbäumen an freigestellten Bestandesrändern. **[Changes in form and increment of conifers on recently exposed margins of stands.]** *Abstr.* in *Berichte aus der land- und forstwirtschaftlichen Forschung, Bad Godesberg* 6, *Suppl.* No. 1, 1959 (10). [G.]

Briefly summarizes a lecture based on stem analyses of Spruce and Pine by E. Siostrzonek and E. Zahn [cf. *F.A.* 20 No. 2177]. In trees adjacent to recently cut lanes for roads or power lines, exposure resulted in reduced diameter increment, and, particularly on margins exposed to the west (the prevailing wind direction), in excentric growth near the base—the rings to windward becoming narrower and those to leeward much wider.

181.3. Water, Soil and Root Relations

See also Nos. 9, 12, 355, 887–90.

232. **Bibliography on soil requirements of forest trees (1940–1958).** *Bibliogr. Bur. Soils, Harpenden* No. 186, 1959. pp. 34.

Comprises 178 references, with brief abstracts, arranged by species (Oak, Beech, Birch, Poplar, Chestnut, Eucalypts, Black Locust, Teak, Larch, other conifers, and various tropical and subtropical species).

181.31. Water Relations

See also Nos. 56–61, 98–108, 159, 257–9, 343, 529.

233. KAWANA, A., KUROIWA, K., and TANAKA, S. **[Several aspects of the over-moist [high water-table] forestry [land] on the sea coast of Kujukuri (V). Standing crop of the 25–30 years old forests of Japanese Red Pine (*Pinus densiflora* S. et Z.).]** *J. Jap. For. Soc.* 40 (10), 1958 (438–42). 7 refs. [Jap.jap.e.*e*.]

[Cf. *F.A.* 19 No. 4749.] A survey showed no significant variations in height, d.b.h., mean and total stem volume/ha., with ground-water level, except for the low productivity of trees round marshes in the early stages of growth.

234. VAJČIS, M. V. O nekotoryh osobennostjah potreblenija počvennoj vlagi nasaždenijami listvennicy i eli na dernovo-slabopodzolistyh počvah. **[Some features of soil moisture requirements of *Larix decidua* and *Picea abies* on soddy weakly podzolic soils.]** *Trud. Lab. Lesoved., Moskva* No. 1, 1960 (202–17). 30 refs. [Russ.]

Investigations were made on natural Spruce stands and planted Larch on sandy clay-loam soils in Lithuania in 1955 and 1956. Larch used 50–100% more moisture than Spruce. Mature stands used 20–50% more moisture than young stands of the same species. Young Larch (20 years) used more moisture than mature Spruce (95–100 years). Larch used moisture from a considerable depth (down to 170–200 cm.), especially during droughty periods, while Spruce took its moisture mainly from the top 50 cm. of soil.

181.32/34. Soil and Nutrient Relations

See also Nos. 19–22, 24–31, 33, 85–8, 256–8, 300, 429–31, 445, 656–61, 739, 1034.

235. **A selected bibliography on nutritional requirements of forest trees (1952–1958).** *Bibliogr. Bur. Soils, Harpenden* No. 164, 1958. pp. 9.

Comprises 42 references, with brief abstracts.

236. STERN, W. L., and VOIGT, G. K. **Effect of salt concentration on growth of Red Mangrove in culture.** *Bot. Gaz.* 121 (1), 1959 (36–9). 9 refs. O.B.D.

Seedlings of *Rhizophora mangle* were collected in Florida and grown in Connecticut for 5 months in greenhouse cultures having different combinations and concentrations of NaCl, $MgCl_2$, $CaCl_2$ and K_2SO_4, (Na, Mg, Ca and K at various concentrations and in different combinations all added as chlorides except K, which was added as a sulphate) the highest concentrations corresponding roughly to sea water. In all cases the application of salts increased dry-matter production, the effect being particularly pronounced at the highest concentration.

237. GRUZDEV, D. M. Principy podbora drevesnyh porod dlja sozdanija zaščitnyh nasaždenij na orošaemyh zemljah Azerbajdžanskoj SSR. **[Principles in selecting woody species for creating protective stands on irrigated lands in Azerbaijan.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (19–46). [Russ.]

A full account of work already noticed [cf. *F.A.* 21 No. 1536]. A list of 15 main and 15 secondary tree species and 6 shrubs recommended for some or all of the 4 main growth regions is included.

238. ALEKPEROV, S. A., and MAMEDOV, S. M. Razvitie kornevoj sistemy drevesnyh i kustarnikovyh porod na zasolennyh zemljah. **[Development of the root system of trees and shrubs on saline land.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (226–38). [Russ.]

[Cf. *F.A.* 21 No. 1636.] Describes, with illustrations, the root system of 3-year-old *Quercus longipes, Morus* sp., *Amorpha fruticosa, Ailanthus* [*altissima*], *Sophora japonica, Gleditsia* [*triacanthos*] and *Elaeagnus angustifolia* on very saline soils in the centre of the Milsk steppe, Azerbaijan. All species developed a superficial root system in the top 50–55 cm. of soil (0·46–1·1% salinity), except *E. angustifolia*, the root system of which went down to 70–75 cm. (0·96–1·46% salinity). On slightly saline soil, *Q. longipes, Morus* sp. and *A. fruticosa* developed normal root systems.

239. KARSCHON, R. **Lime tolerance and seed provenance in Eucalypts.** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/60–9b*, 1960. pp. 7. [E.] Limited distribution.

Gives preliminary results from two Eucalypt plots in the Esdraelon valley, Israel, on a heavy alluvial clay, with more than half the $CaCO_3$ occurring as active lime. It is concluded that even small-scale elimination trials, on soils known to induce Fe chlorosis, are suitable for determining the ability of species or provenances to grow on calcareous soils. In species such as *Eucalyptus rostrata* with a wide area of distribution, ecotypic variation may be expected, and is actually shown to occur. The progeny of seed from various localities in Australia exhibited a significant variation in vigour, growth rate, and ability to grow on calcareous soils. [Cf. *F.A.* 20 No. 650.]

240. YOSHISUJI, S., and KAWASOE, T. **[Studies on the *Eucalyptus* spp. (2) Relation between pH value of water culture solution and the growth of *Eucalyptus* spp.]** *J. Jap. For. Soc.* 40 (5), 1958 (191–4). 9 refs. [Jap.jap.e.e.]

Gives results of experiments in which *E. rostrata* seedlings were raised in nutrient solutions at 5 different pH values. The most favourable pH range for growth in the water culture was 4·6–6·6, growth being very poor below 3·5. Fairly good growth is possible on gravel up to a pH of ca. 7·7.

241. **Bibliography on effect of silvicultural practices on soil properties (1935–1958).** *Bibliogr. Bur. Soils, Harpenden* No. 190, 1959. pp. 4.

Comprises 19 references with brief abstracts.

242. SAMUSENKO, V. F. Izmenenie fiziko-himičeskih svojstv podzolistyh počv pod vlijaniem elovyh i listvennyh kul'tur. **[Change in the physical and chemical properties of podzolic soils under Spruce and Larch plantations.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (169–90). 15 refs. [Russ.]

Studies in plantations 15, 56, and 95 years old in the Moscow and Smolensk regions confirmed the beneficial effects of Larch on podzolic soils.

243. ŠUMAKOV, V. S. K voprosu o vlijanii smeny porod na plodorodie počvy. **[Influence of succession on soil fertility.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 34, 1958 (126–34). 3 refs. [Russ.]

Tabulates data on the chemical and physical changes in the soil after natural succession by Birch on clear-fellings in taiga Spruce forests. This succession arrested the process of podzolization and increased fertility but is silviculturally undesirable. The possibilities of mixtures (Pine/Birch) are being studied.

244. PARŠEVNIKOV, A. L. Smena porod v elovyh lesah srednej tajgi i ee vlijanie na počvy. **[Succession in Spruce forests of the central taiga zone and its influence on the soil.]** *Soobšč. Inst. Les.* No. 9, 1958 (53–63). 21 refs. [Russ.]

Birch temporarily replaces Spruce on clear fellings in Vologda province. To determine its effects on the soil, analyses were made of soils under Spruce and Birch of various ages on (*a*) peaty-humus gley-type clay-loams where the forest type had been the *Piceetum herboso-hylocomiosum*, and (*b*) medium-podzolic clay-loams of the *P. myrtillosum*. [Cf. *F.A.* 21 No. 61.] Extensive tabulated data are presented. Birch, which replaces Spruce on fellings and is present in older Spruce/broadleaved stands, improves the chemical properties of (*b*), but has no marked soil-improving effect on (*a*). Stand yield could be considerably increased by measures against waterlogging of the soil.

181.35. Special Modes of Nutrition. Symbiotic Relationships. Parasitism

See also Nos. 646–7.

245. ARNOLD, B. C. **Isolation of a fungus from mycorrhizas of *Nothofagus cliffortioides* (Hook. f.) Oerst.** *Trans. Roy. Soc. N.Z.* 87 (3/4), 1959 (235–41 + 1 set of photos). 14 refs. O.R.S.

A fungus resembling *Mycelium radicis-fagi* was isolated from the mycorrhizae of *Nothofagus cliffortioides*. Secretions of the fungus in liquid culture show strong auxin activity. It is suggested that secretions of auxin by fungi of ectotrophic mycorrhizae tend to inhibit growth of the host roots, and thus enable the mantle to envelop them. *From author's summary.*

246. MOSER, M. Beiträge zur Kenntnis der Wuchsstoffbeziehungen im Bereich ectotropher Mycorrhizen I. **[Growth-substance relationships of ectotrophic mycorrhizae. I.]** *Archiv für Mikrobiologie, Berlin* 34 (3), 1959 (251–69). [G.g.] O.R.S.

Presents results of a study in which some 25 mycorrhizal fungi (from *Pinus cembra*, Scots Pine, Norway Spruce, Larch, Birch and Beech) were grown in culture. The mycorrhizal fungi produced IAA and other indole compounds from tryptophane more generally than non-mycorrhizal fungi.

247. TSERLING [CERLING], G. I. **Mycorrhiza of the Larch and its effect upon growth and the condition of seedlings in carbonate chernozems of Trans-Volga districts.** *Microbiology, Washington* (*Transl. of Mikrobiologija*) 27 (4), (1958) 1959 (442–51). 9 refs. N.L.L.

In a nursery at Kinel (Kuibyshev Agricultural Institute), the addition of mycorrhizal soil from a 10-year Larch stand plus superphosphate did not suffice to produce healthy seedlings on these soils, on which transplanted Larch was known to grow well, but seedlings to fail. The seedlings on these plots germinated well, but soon became discoloured and stopped growth, though ca. 35% (of which only 0·8% developed mycorrhizae) survived to the end of the second growing season. In plots where sand had been added to improve aeration, and even more where powdered S had been added, reducing pH from 7·4 to 7, patches of seedlings suddenly turned green again and gradually resumed growth, resulting in 38 and 46% survivals, of which 24 and 65% respectively had mycorrhizae. Growth and vigour were strongly related to the degree of mycorrhizal development, the largest plants with most mycorrhizae being 24·8 cm. high and weighing 2·18 g. air-dry, vs. 3·3 cm. and 0·008 g. for those without mycorrhizae. Two types of mycorrhiza, a white and a yellow, are described. In a second series of plots, a bacterial fertilizer (including 'azotobacterin', 'phosphorobacterin', and a preparation of silicate bacteria) [cf. *F.A.* 21 No. 1707–8] greatly increased the number of mycorrhizal seedlings over the controls that had only received mycorrhizal soil. Further additions of B, Mn, Zn, or Mb increased their numbers further, and when all trace elements were added jointly, the numbers of mycorrhizal seedlings rose to 96% of survivals (which were 84% of germinations). Seedlings grown in inoculated but otherwise untreated dark-grey soil (pH 6·6) all developed mycorrhizae and showed excellent survival and growth. [Cf. *F.A.* 21 No. 409.]

248. LEVISOHN, I. **Physiological and ecological factors influencing the effects of mycorrhizal infection.** *Repr.* from *New Phytol.* 59, 1960 (42–7). 9 refs.

[Cf. *F.A.* 20 Nos. 4272–3.] Isolates of *Boletus scaber* from different localities were compared in culture and were found to fall into two groups, viz. growing (*a*) vigorously or (*b*) only moderately well or not at all, on culture media or on steam-sterilized conifer, broadleaved and heather litters. One of the (*a*) forms (that from Wareham) was used in pot-culture experiments with Birch and Pine seedlings. In previous experiments with Birch [see *F.A.* 20 No. 255], introduction of the fungus into a particular heathland soil from Yorkshire had caused pronounced retardation of seedling growth, with markedly smaller and discoloured leaves. In the present series of experiments, seedlings were grown in Wareham soil uninoculated (1), or inoculated with sterilized (2), or unsterilized (3) Yorkshire soil. During the first and following years, growth of seedlings in series (2) was not affected. Those in series (3) showed reduced vigour, smaller and discoloured foliage and, by the fourth year, early maturation. Root examination showed that trees in (3) were heavily attacked by *Mycelium radicis atrovirens*, though few infections were found in (1) and (2), and that the form present in (3) was *M.r. atrovirens* β, causing damage to young trees in certain ecological conditions and less common than *M.r. atrovirens* α, which is widely distributed in forest soils and fairly innocuous. The form of *B. scaber* used in the experiment exercises a vigorous rhizosphere activity accompanied by delay in actual mycorrhiza formation, and it seems that during this period before mycorrhizae form, the root is exposed to attack by the harmful mycelium of *M. r. atrovirens* β. In the experiments with Pine, which does not appear to be a congenial partner for the fungus in nature, seedlings grown in various sterilized and unsterilized heathland soils were not affected by the introduction of *B. scaber*, whereas seedlings in sand cultures showed a pronounced increase in growth.

This suggests that in the relatively inert sand-culture medium, lacking an essential food minimum, the fungus is more dependent on root tissues as a source of nutrients, and that lack of other nutrients is an essential for the formation of mycorrhizae by *B. scaber* with Pine.

249. BAYLIS, G. T. S. **Effect of vesicular-arbuscular mycorrhizas on growth of *Griselinia littoralis* (Cornaceae) [with an appendix: Chemical composition of plants (*A. D. Campbell* and *G. T. S. Baylis*).]** *New Phytol.* 58 (3), 1959 (274–80 + 1 plate). 8 refs. O.R.S.

The endophyte, a vesicular-arbuscular phycomycete, could not be induced to make more than transient growth on agar, but survived for 26 months in soil kept moist. In experiments using a sterilized soil in which ectotrophic mycorrhizae proved to be necessary for sustained growth of *Pinus radiata*, the endotrophic mycorrhizae of *G. littoralis* were necessary for its sustained growth. *Myrsine australis*, a non-mycotrophic tree, grew steadily in the sterilized soil. The technique used to establish mycorrhizae on *G. littoralis* [transferring the seedlings for 6 months to soil from beneath *Griselinia* trees] did not stimulate its growth if mycorrhizae were not formed; it produced no symbiotic infection in Pine and only traces of infection in *M. australis*, and it depressed the growth of both species. In both Pine and *G. littoralis*, P content of mycorrhizal plants was consistently higher and N content lower than that of non-mycorrhizal plants. *From author's summary.*

250. **Mycorrhizae of Southern Pines.** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1959*, 1960 (28–30).

Briefly describes early results of infection trials with 17 agarics on Shortleaf, Loblolly, Slash, and Longleaf Pine. So far only *Clitocybe laccata* has produced positive reactions on all 4 Pines. By passing a weak direct electric current (0·05 milliamps) through an agar medium for 72 hours, a fixed pH gradient from ca. 2 to 10 could be produced electrochemically, which proved very useful for culture purposes.

251. BOULLARD, B. La lumière et les mycorrhizes. **[Light and mycorrhizae.]** *Année biol.* (*n.s.*) 36 (5/6), 1960 (231–48). 36 refs. [F.] O.R.S.

Reviews research and presents some original results. These include some results of experiments with seedlings of *Pinus pinaster*, 6 and 8 months old, showing an increase in the % of mycorrhizal roots with increasing photoperiod, from 8 to 24 hours. The need for adequate light to ensure mycorrhizal growth is stressed and the relations of altitude and latitude with optimum conditions for mycorrhizae are briefly discussed.

252. HARLEY, J. L., and WILSON, J. M. **The absorption of potassium by Beech mycorrhiza.** *New Phytol.* 58 (3), 1959 (281–98). 14 refs. O.R.S.

The processes of absorption and loss of K, Na and Rb by excised mycorrhizae were studied. The internal K content of mycorrhizae was found to be ca. 70 μg. equiv./100 mg. dry tissue, and the Na content ca. $\frac{1}{10}$ of this value. Temperatures > 20° C., O tensions < 3%, and low concentrations of metabolic inhibitors cause loss of K, the process at low O tensions being very sensitive to temperature. The rates of absorption of K, Na and Rb are affected by temperature, with optima at 15–20°. The rates of absorption of the alkali metals are O-sensitive, that of K reaching zero at ca. 3% O. Rb absorption from isotopically labelled chloride solutions does not cease in low O tensions, owing to physical equilibration of the solution with the tissues. Alkali-metal absorption is inhibited by metabolic inhibitors. Its rate in mycorrhizae that have been stored in water for some days is stimulated by a supply of glucose. These results are discussed and it is concluded that the absorption of alkali metals by mycorrhizae is dependent on an oxidatively produced carrier. *From authors' summary.*

253. HARLEY, J. L., and AP REES, T. **Cytochrome oxidase in mycorrhizal and uninfected roots of *Fagus sylvatica*.** *New Phytol.* 58 (3), 1959 (364–86). 23 refs. O.R.S.

181.36. Root Relations and Root Development etc.

See also Nos. 111–2, 238, 348, 460.

254. KOZLOWSKI, T. T., and COOLEY, J. H. **Natural root graftings in forest trees.** *For. Res. Note Wis. Coll. Agric.* No. 56, 1960. pp. 2. 5 refs.

In studies in Wisconsin, root grafting between adjacent trees of the same family was noted in *Acer saccharum*, *A. rubrum*, *Betula lutea*, *B. papyrifera*, *Abies balsamea*, *Tsuga canadensis*, and *Thuja occidentalis*. Root fusion in excavated groups of *A. balsamea* and *A. saccharum* is briefly described.

255. BILAN, M. V. **Root development of Loblolly Pine seedlings in modified environments.** *Bull. Dep. For. S. F. Austin St. Coll., Texas* No. 4, 1960. pp. 31. 27 refs.

Roots of 1 + 0 stock, bar-planted in an open field in E. Texas, were dug out and weighed one year later. Oven-dry weight of whole plants and of the roots found in a 29-in. cube of soil were greatest on one plot (*a*), which had been scalped and left bare (179·9 and 89·7 g. respectively), and least on the control (*b*) with undisturbed sod (38·4 and 18·6). Soil moisture contents in July and Aug. were lower on these two than on 3 other intermediate plots that had been scalped and given (*c*) a Pine-needle mulch or (*d*) 50% shade or (*e*) both, though even on (*a*) and (*b*) wilting point was only reached in the top 3-in. layer. The shoot/root ratio was highest in (*e*) (1·47). Except for (*a*), the top 3 in. had significantly higher root-weights/cu.m. than the lower layers, the maximum being 68% in (*c*), and on all plots the 3- to 6-in. layer had a greater weight of roots than those below. Vertical roots penetrated deepest (ca. 4 ft.) on (*a*) and (*b*) and least on (*c*) (2·5). Laterals were longest on (*c*) and (*e*) (7 ft.) and shortest on (*a*) (4 ft.). On (*a*) and (*d*), mycorrhizae were abundant on lateral feeder roots. On (*c*) and (*e*), conspicuous mycorrhizae were absent, and surface roots were only weakly lignified. On all plots, root concentration in soil continuing the line of the planting slit was almost double that in soil at right angles to the slit.

256. Utkin, A. I. Nekotorye osobennosti rasprostranenija kornevyh sistem drevesnyh porod v holodnyh počvah. [**Some features of the distribution of root systems of tree species in cold soils.**] *Soobšč. Inst. Les.* No. 9, 1958 (64–71). 8 refs. [Russ.]

Studies were made in 9 *Larix gmelinii* forest types, and in one Scots Pine and one Spruce type, in Central Yakutia. Larch had well developed surface roots; the tap-root stops growing early, but survives for some time. The lateral roots of the Pine grow downwards at an acute angle; the tap-root is relatively well developed and does not die. On soils that thaw out to a good depth, the main mass of Larch roots is found in the top soil layers, which have temperatures of 8–3° C. in late Aug./early Sept. On soils with permafrost near the surface, most Larch and Spruce roots are found in the top layers (5–2°); some roots end in layers with temperatures of 2–1°, and sometimes even immediately above the permafrost. Pine, growing on relatively warmer soils, has its roots mainly in layers with a temperature of 9–6°, and does not usually penetrate below layers with a temperature of 4–3°. In these permafrost regions, where precipitation is small and droughts are frequent, a surface root system makes the best use of the available precipitation.

257. Afanas'eva, E. A., and Olovjannikova, I. N. Stroenie kornevyh sistem i vodnyj režim južnyh černozemov v zarosljah podlesočnyh kustarnikov. [**The structure of root systems and the moisture regime in the southern chernozems in shrub thickets.**] *Trud. Inst. Les.* No. 43, 1958 (80–123). 24 refs. [Russ.]

The investigations were made on 10 × 10 m. sample plots in almost pure coppice growth of (*a*) *Acer tataricum*, (*b*) *Lonicera tatarica*, and (*c*) *Caragana arborescens*, canopy closure being complete or nearly complete in each case. Data are tabulated and graphed on the soil moisture content, structure of root system (with drawings), humus content, soil structure, weight of roots, the seasonal migration of salts in the soil, etc. *L. tatarica* is the best species for soil improvement.

258. Afanas'eva, E. A., and Karandina, S. N. Soprjažennoe izučenie stroenija kornevyh sistem i vodnogo režima južnyh černozemov pod drevesno-kustarnikovym nasaždeniem. [**A combined study of the structure of root systems and the water regime in southern chernozems under stands of trees with shrubs.**] *Trud. Inst. Les.* No. 43, 1958 (124–37). 4 refs. [Russ.]

The study was made on a S.W. slope in the Beloprud forest, on a plot containing *Fraxinus pennsylvanica* (poor), *Quercus robur* (good), and a few Elms and Aspens, with a well developed shrub layer mainly of *Acer tataricum*. Horizontal and vertical projections of the root systems *in situ* are presented. The total weights of roots (six diameter classes from < 1 mm. to > 10 mm.) by 10-cm.horizons down to 300 cm. are tabulated for a plot of 1 sq. m. Chemical analyses were made of the soil by 10-cm. layers down to 450 cm. Soil moisture content and total water loss during the growing seasons of 1952 and 1953 are compared with those of a Maple/Oak stand.

259. Olovjannikova, I. N. Vzaimootnošenija drevesnoj i travjanoj rastitel'nosti v lesnyh nasaždenijah na južnyh černozemah Balašovskoj oblasti. [**The inter-relationships of the woody and herbaceous vegetation in forest plantations on southern chernozems in Balashov region.**] *Trud. Inst. Les.* No. 43, 1958 (5–79). 72 refs. [Russ.]

Reports the findings of investigations in 1950–53 on the inter-relationships of the tree and herbaceous vegetation above and below ground level, in (*a*) Oak/Maple, (*b*) healthy Ash/Elm, and (*c*) dying Ash/Elm stands in the Beloprud forest massif, S.E. Russia. Drawings of actual soil profiles are presented, showing plant roots *in situ*. The litter-and-humus layer in (*a*) amounted to 12–15, in (*b*) 7, and in (*c*) 5 metric tons/ha. (air-dry weight). In (*c*), 30–50% of this layer was derived from the ground vegetation. The weight of the herbaceous vegetation in (*a*) was 60–70, in (*b*) 750, and in (*c*) 1000–2500 kg./ha. Tree roots in (*a*) dominated the whole soil profile from the surface to a depth of 400 cm., the quantity of roots of herbs being negligible. In (*b*), roots of both trees and herbs occupied the humus horizon (0–50 cm.), but tree roots predominated below this; in the top 5-cm. layer, the total mass of fine (< 1 mm. diam.) roots was 901 g. vs. 514 g./sq. m. in (*a*). The ability of (*a*) to change the light and soil-moisture regimes in favour of woody species, suppressing herbaceous species and arresting the tendency towards steppe formation, is greater than that of (*b*). The ability of (*b*) to survive is due largely to the well developed surface root system of Ash; unfavourable sites are invaded by steppe vegetation and stands of type (*c*) are found. Silvicultural recommendations are made, particularly for conversion to stands of type (*a*).

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See Nos. 111–2, 114–5, 259, 288, 804.

181.5. Reproductive Behaviour

See also Nos. 119, 122–3, 141, 183, 271–2, 314, 328 *et seq.*, 395 *et seq.*, 804, 1220–1.

260. Favre-Duchartre, M. Contribution à l'étude de la reproduction sexuée chez *Araucaria araucana*. [**Sexual reproduction in *A. araucana*.**] *C.R. Acad. Sci., Paris* 250 (26), 1960 (4435–7). 7 refs. [F.f.] O.R.S.

261. Yanagihara, T. [**On the time of flower bud differentiation of Japanese Larch (I).**] *J. Jap. For. Soc.* 40 (8), 1958 (343–4). 2 refs. [Jap.e.]

No difference was observed in the time of flower formation for *Larix leptolepis* buds collected at 980 and 1440 m. alt. Differentiation of the buds occurred in the second half of July in each case.

262. Wang, C.-W., Perry, T. O., and Johnson, A. G. **Pollen dispersion of Slash Pine (*Pinus elliottii* Engelm.) with special reference to seed orchard management.** *Silvae Genet.* 9 (3), 1960 (78–86). 32 refs. [E.e.g.f.]

Observations were made on pollen dispersal of *P. elliottii* during the years 1956–58, and the results, combined with a review of literature, provide the

basis for a discussion of the significance of pollen-dispersal patterns in the formation of tree races, and the establishment and management of seed orchards. Pollen dispersal of *P. elliottii* was studied in (1) an isolated single tree in a large open area, (2) isolated natural groves, and (3) plantations. Pollen specimens were collected at distances from the source tree of 0–2500 ft. The pollen frequency at 400–500 ft. was 2–5% of that at the source. Isolation strips of 500 ft. may be considered the minimum for Slash Pine seed orchards. Data are presented on the effectiveness of 400 ft.-wide barriers in 6 existing Slash Pine seed orchards. A distinct correlation was observed between the increase in Slash Pine pollen output and the rise of temperature in the flowering season. The effects of pollen size and of wind on pollen dispersal are also discussed. The standard deviation of the pollen dispersal distance (σ_D) was calculated from pollen counts. The values of σ_D are 220 ft. and 226 ft. respectively for a single Slash Pine and a plantation. The possibility of race formation as expressed in the size of breeding population and the degree of isolation is estimated in terms of 'neighbourhood' size (N), which is the largest population within which breeding takes place at random, according to the following formula for a hermaphrodite population with a continuous range and only the pollen dispersed: $N = 2\pi\sigma_D^2 d$ (where d is the assumed population density in terms of number of flowering trees per sq. foot of areally continuous range). Assuming areal continuity, σ_D of 225 ft., and 50 flowering trees/acre, the value of N is 365 trees. With this value of N there should be little opportunity for racial differentiation within any continuous range of Slash Pine forest. However, the presence of barriers in the form of sand, swampland, and open waters, greatly reduces the normal function of random pollination.

263. GATHY, P. Essai de détermination de la fertilité de pins de Koekelare (*Pinus nigra* Arnold var. *calabrica* Schneid. cultivar Koekelare). [**An attempt to determine the fertility of 'Koekelare Pines' (*P. nigra* var. *calabrica* cv. Koekelare).**] *Trav. Sta. Rech. Groenendaal* (*Sér. B*) No. 24, 1959. pp. 32. 27 refs. [F.f.e.]

A study was made on 15 trees from a 65-year stand, based on total production of cones and seeds per tree and per annum for 5 years. Statistical analysis of the results of different tests enabled the trees to be ranged in 4 classes: inferior (minus), doubtful, normal, and superior (plus). The criteria used were: total weight of cones (C); total weight of seeds (g); the g/C ratio; number of 1-year seedlings ($S1$); the $S1/g$ ratio; total number of 2-year seedlings ($S1R1$); the $S1R1/C$ ratio; and the ratio $S1R1/S1$. A study of the correlation between these criteria of fertility and a coefficient of 'total external productive capacity' (calculated arbitrarily as a function of crown volume, dominance, and isolation of the tree) made it possible to eliminate the effects of external factors and assess the role of genetic factors in determining the fertility of individual trees. The importance of these genetic factors was demonstrated. Very large differences were also found between one year and another for all criteria. These Pines appear to produce cones on a special type of biennial cycle.

264. MARJAI, Z. A nyármag érése és érettsége. [**Ripening and maturity of Poplar seeds.**] *Erdész. Kutatás., Budapest* 6 (3), 1959 (1960), (67–92). 8 refs. [Hu.russ.g.e.*russ.g.e.*]

A detailed investigation of the germination of Poplar (mainly *P. alba* but also some *P.* × *marilandica*) seed with particular reference to the relation between 'ripeness' (i.e. the state in which some seed first germinates) and maturity. Germinative capacity and energy are both low in 'ripe' seed and resulting seedlings are often not viable. Dry-matter content of seeds is related to maturity: so long as this is < 30%, germinative energy is low or zero, but it suddenly increases to 60–70% in the course of a day, immediately before maturity is attained.

265. HARITONOVIČ, F. N. Vlijanie raznoj intensivnosti rosta drevesno-kustarnikovyh rastenij na plodonošenie. [**Effect on fruiting of different growth rates in woody shrubs.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 34, 1958 (5–19). [Russ.]

An account of trials since 1951 on *Euonymus europaeus*, in which earliness and abundance of fruiting were clearly related to growth vigour. The possibilities of ensuring early and heavy fruiting by means of correct tending (fertilizing, tillage, etc.) are pointed out.

266. GINDEL, I. **Biological function of fruit.** *Nature, Lond.* 187 (4731), 1960 (42–4).

A study was made of chemical changes occurring in pulpy fruits during germination of their seeds. Indehiscent fruits from indigenous (Israeli) forest trees and shrubs were collected soon after they had matured, and stored at room temperature until sowing; 100 fruits from each tree sample were sown in sandy seedbeds at Rehovot. Observations were also made on seed of various fruit trees grown in Israel. The following germination %'s were obtained for various forest seeds left within their fruits (only the seeds in fruit not attacked by fungi or insects germinated): *Arbutus andrachne* 32, *Celtis australis* 78, *Ceratonia siliqua* 9, *Elaeagnus angustifolia* 14, *Laurus nobilis* 19, *Melia azedarach* 64, *Pyrus syriaca* 40, and *Rhamnus alaternus* 44. During tests of fruits of *A. andrachne*, *C. siliqua*, and *Mangifera indica*, the seeds of which had germinated in the sown beds, it was found that their pH, which before sowing was 4·12, 4·85, and 4·2 respectively, had increased to 5·38, 6·34, and 5·5. Germination of seed within the fruit itself was observed in tomato, apple, cucumber, avocado, anona, grapefruit and lemon. From these experiments and observations it is concluded that the so-called inhibiting substances, that prevent the seed from germinating, change, in the course of the metabolism of the fruit, into new compounds that favour germination. The biochemical composition of the fruit reaches a condition whereby the radicle of the germ is enabled to make contact with the pulp content of the fruit, and this provides it with its first food before reaching the mineral soil in the forest

litter. Within the germinating fruit the roots steadily increased in size, many of them branching inside the fruit rather than penetrating the soil through the perforated coat.

267. ENGLE, L. G. **Yellow-Poplar seedfall pattern.** *Sta. Note Cent. St. For. Exp. Sta.* No. 143, 1960. pp. 2. 1 ref.

In a 2-year study in a mixed hardwood stand in S. Indiana, most seed of *Liriodendron tulipifera* fell to the N. and N.E. of the seed-trees and was sufficiently dense for adequate stocking (50,000 seeds/acre) for ca. 350 ft. from the seed-tree in those directions, vs. 150 ft. to S. and S.W. This was explained by prevailing S. and S.W. winds when the rate of seedfall was highest. [Cf. *F.A.* 16 No. 3984.]

268. MÁRKUS, L. Bükkmakk terítettségi megfigyelések a Magasbakonyban. [**The distribution of Beech mast on the ground in the Magasbakony Mountains.**] *Erdész. Kutatás., Budapest* 6 (3), 1959 (1960), (93–101). 4 refs. [Hu.hu.russ.g.e.]

A study was made of the amount and distribution of Beech mast on 101 sample plots in different forest types. Distribution, expressed as number of dropped nuts/ha., varied widely even within the same compartment. Trees growing on the margin of a stand produce more nuts than those in the interior, and their viability and 1000-seed weight are higher. This edge effect ceases at a distance of about 1½ tree-heights inside the stand. Stands with 50–60% crown closure yield more mast than those with 80–90%. The amount of seed produced on the north side of the crown is less (41% of total) than that on the south side, but of better quality. The distribution of mast on the ground immediately below the crown projection decreases from the bole outwards.

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 113–7, 231, 326–7, 524, 804, 885, 1153.

269. **Variations in Monterey Pine.** *Extr.* from *Rep. For. Timb. Bur. Aust. 1958*, 1959 (23).

Investigation of the growth characteristics of *Pinus radiata* was continued and the following correlations were noted: (i) Trees that produce only a few whorls of branches have, in general, thick branches that tend to make an acute angle with the trunk. Such trees tend to suffer from internodal bends, and also produce very few cones. (ii) Trees with thick branches tend to produce more cones than thin-branched trees. (iii) Branches on the windward side of leaning trees not only make a more acute angle with the trunk than on the lee side, but tend to be thicker. (iv) Trees with acute-angled branches tend to have straighter stems than trees with wide-angled branches. (v) The extent of the nodal swelling, in almost all cases, is directly proportional to the volume of the branches included in the trunk at the node but, in rare cases, the swelling is much greater than can be explained by the volume of the included branches.

270. SCHMIDT, W. Zur Analyse von Dickungen nebst Folgerungen für Anerkennung und Auslesedurchforstung. [**The evaluation of thickets [of Scots Pine] and its bearing on [seed] certification and selective thinning.**] *Forstarchiv* 31 (7), 1960 (105–9). 9 refs. [G.]

Analysis of variance of branch weights in 10-year-old plantations of 60 East European and 4 West European provenances planted at either 0·3 × 0·3 or 1 × 1 m. spacing indicated that spacing accounted for 83% of the variation and provenance for only 1·5%. All western provenances were coarse-branched, while in the eastern, both coarse- and fine-branching types were found, but no clear geographical pattern emerged. Coarse-branched types were faster growing, with close correlation between branch- and stem-weight, and profited more from wider spacing. Branching habit is considered a poor criterion for evaluating the genetical properties of a stand, nor is thinning based thereon considered likely to improve its genetic constitution.

271. GRAM, K., and LARSEN, C. S. **The flowering of Teak (*Tectona grandis*) in aspects of tree breeding, based on observations in Thailand.** [*Docum.*] *3rd Sess. FAO Teak Sub-Comm., New Delhi 1960* No. *FAO/TSC*-60/3.2, 1960. pp. 4 + 6 photos. Limited distribution.

Discusses the effect of flowering habit on the growth form of Teak, individual differences in the length of the juvenile period (during which a straight, unforked stem develops), and the possibility that these differences may be genetically conditioned.

272. KOROVIN, V. A. 'Vetkopad' u topolja. ['**Twig shedding' in Poplars.**] *Priroda, Moskva* 49 (6), 1960 (68). [Russ.] A.P.B.

To determine whether twig shedding in autumn is a means of natural vegetative reproduction, fallen 2- to 7-year-old twigs of *Populus balsamifera* were kept in moist sand at 2–5° C. until Jan., and then moved to a greenhouse and kept half covered with moist sawdust. No rooting or bud growth were recorded, and the twigs died. Controls (cuttings taken from epicormics and from branchlets in the middle and upper crown in autumn) all rooted when similarly treated. Microscopic observation at the start of the experiment showed no starch, and a very low fat content, in the shed twigs, whereas both were abundant in the controls.

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

273. HLOPOV, JU. P. Sibirskaja lipa. [***Tilia sibirica.***] *Priroda, Moskva* 49 (5), 1960 (75–6). [Russ.] A.P.B.

A relict species represented on an area of ca. 10,000 ha. in W. Siberia. Exceptional specimens ca. 300 years old attain heights of 30 m. and d.b.h. > 100 cm., but unsystematic fellings, fires, etc. are rapidly reducing the area of the species, and the creation of reserves is urged.

181.8. Phenology

See also Nos. 168–9, 261, 388, 898–9.

274. EDLIN, H. L. **Flower and leaf in the late spring of 1960.** *Quart. J. For.* 54 (3), 1960 (247–50).

The effect of temperature and light on the leafing

and flowering of some native and exotic trees, and the underlying scientific principles controlling them, are discussed with particular reference to the spring of 1960, which remained cold exceptionally late.

275. SINGH, G. J. R. **Peculiar phenological behaviour of Teak in South Madras.** *Indian For.* 86 (8), 1960 (488). 3 refs.

Reports on what is apparently a local strain of Teak in the Ramnad and Tirunelveli districts, which differs morphologically from other forms, and flowers and fruits at different seasons from Nilambur or South Coimbatore Teak. At its best, it reaches 20 ft. in height and 6 in. d.b.h. Coppice shoots grow readily and reach this height in 4–5 years, but then stagnate. A good return is gained by clear felling the pure or almost pure stands every 6–10 years, and marketing the poles.

181.9. Miscellaneous (Including the Ecological Role after Death of Plants or Parts of Plants)

See also No. 723.

276. KELNER-PILLAULT, S. Sur le pH des terreaux d'arbres creux (châtaigniers et saules) et son influence sur la faune. **[The pH of mould in hollow trees (Chestnuts and Willows) and its influence on the fauna.]** *C.R. Acad. Sci., Paris* 250 (11), 1960 (2045–6). [F.] O.R.S.

In the early stages, the mould consists mainly of wood debris and excreta of wood-eating insects, later becoming mixed with soil. The pH range for Chestnuts was 3·2–4·7, that for Willows 5·6–7·5, the greater acidity for Chestnut being caused by the pH of the wood (Chestnut 4·2, Willow 5·8) and of the sites (6 and 7 respectively). The increase in pH value during the formation of the mould is caused by decrease in the proportion of woody elements and increase in the amount of soil. The position of the cavity in the trunk does not necessarily affect its pH. pH values were not affected by whether the tree was living or dead, values of 5·6 and 5·8 being obtained for Willow and 3·2 and 3·7 for Chestnut for dead and living trees respectively. Mould exposed to rain was less acid than that sheltered from it. The pH of the mould appeared to have little influence on its insect populations. [Cf. *F.A.* 15 No. 3229.]

182. Synecology, Plant Sociology: General, Principles and Methods

277. SUSMEL, L. Saggio critico-sperimentale sulla applicabilità del metodo fitosociologico in selvicoltura. **[A critical and experimental study of the applicability of phytosociological methods in forestry.]** *Repr.* from *Annali del Centro di Economia Montana delle Venezie, Padova* 1, 1959/1960. pp. 146. 8 pp. of refs. [It.f.]

A detailed and thorough-going attack on the whole theory and practice of the Zurich-Montpellier school, attacking particularly the lack of clear definition of primary concepts (e.g. 'characteristic' species), the unproved assumptions of homogeneity in vegetation types, and the use of statistical analysis to give an impression of scientific exactness to conclusions based on random or heterogeneous data. The author envisages a return to the classic concepts of ecology, particularly to the concept of the phytocoenosis rather than plant associations based on 'characteristic' species.

278. GIACOMINI, V. Alcune precisazioni a proposito di una recente critica di L. Susmel alla fitosociologia. **[Some definitions in connexion with a recent criticism of phytosociology by L. Susmel.]** *Ital. for. mont.* 15 (2), 1960 (61–4). 9 refs. [It.it.f.]

The author objects to Susmel's attempt to treat him as an ally in his attack on the Zurich-Montpellier school [see preceding abstract], and proclaims his adherence to it.

279. SUSMEL, L. Sulle precisazioni di V. Giacomini intorno ad un lavoro di critica alla fitosociologia. **[On some definitions made by V. Giacomini in relation to a critical study of phytosociology.]** *Ital. for. mont.* 15 (3), 1960 (112–8). 12 refs. [It.it.f.]

The author defends his position, particularly his thesis that, while the study of autecology is useful to foresters, the methods of synecology are so unscientific as to render its findings useless.

182.1. Palaeoecology. History of Vegetation. Pollen Analysis

See also Nos. 133, 225.

280. DURNO, S. E., and MCVEAN, D. N. **Forest history of the Beinn Eighe Nature Reserve.** *New Phytol.* 58 (2), 1959 (228–36). 6 refs. O.R.S.

Post-glacial forest history as studied by pollen analysis and peat stratigraphical methods is related to the surviving forest vegetation and the scanty historical records. The pedigree of the Scots Pine has been established, and the *Juniperus communis* subsp. *nana* shown to be of some antiquity. Fire has been a dominant factor from Boreal times to the present day.

281. KRIESL, A. Pyloanalytický průzkum lesního humusu v okolí Červených Janovic u Kutné Hory. **[Pollen analysis of forest humus around Červené Janovice near Kutná Hora [Bohemia].]** *Prace Výzkum. Úst. Lesn. ČSR* No. 17, 1959 (183–216). 60 refs. [Cz.cz.russ.g.]

The changes in the forest vegetation in the last 100 years are discussed.

282. MRÁZ, K. Příspěvek k poznání původnosti smrku a jedle ve vnitrozemí Čech. **[On the natural occurrence of Norway Spruce and Silver Fir in central Bohemia.]** *Prace Výzkum. Úst. Lesn. ČSR* No. 17, 1959 (137–80). 58 refs. [Cz.cz.russ.g.]

Adduces evidence from the 16th to 18th centuries to prove that both Fir and Spruce were plentiful in central Bohemia before the start of afforestation. The decrease in Fir is thought to be due mainly to the tendency towards even-aged stands, where the Fir cannot form a large, deep crown.

283. P'JAVČENKO, N. I., and KOZLOVSKAJA, L. S. K poznaniju istorii Buzulukskogo bora. **[On the history of the Buzuluk Pine forest.]** *Trud. Inst. Les.* No. 37, 1958 (149–62). 14 refs. [Russ.]

Concludes from investigations that the forest first appeared in the early Holocene, in the form of

outliers of Pine/Birch forests, and had developed, in the first half of the middle Holocene, into a continuous forest massif.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 12, 243–4, 295, 298, 496, 800, 812.

284. THOMAS, A. S. **Changes in vegetation since the advent of myxomatosis.** *J. Ecol.* 48 (2), 1960 (287–306). 31 refs.

A survey of changes in vegetation on chalk in England was made by taking repeated records of point-quadrats at intervals along fixed transects on 7 principal sites where rabbits had been abundant. Records were taken from 1954, before the advent of myxomatosis, to 1957. In addition to changes in the herbaceous cover after the death of the rabbits, brambles and gorse have grown greatly, and their seedlings and those of other woody plants are becoming much commoner in grasslands and woods. It is likely that downland not grazed by cattle will be colonized by trees and scrub.

285. ELLIS, R. C. **An observation on the invasion of Black Spruce sites by Balsam Fir in Central Newfoundland.** *Pulp Paper Mag. Can.* 61 (6), 1960 (164, 166).

In many places in Central Newfoundland, an initial apparent conversion to Balsam Fir takes place after felling of Black Spruce stands. However, provided that the Spruce regeneration is not deprived of light by a closed canopy of Fir regeneration, it grows at a steady rate until it exceeds the Fir in height. Data are given on an actual instance: 6 years after felling, the Fir regeneration was $> 1\frac{1}{2}$ times the height of the Spruce, and still growing at 12 in./year; 16 years after felling, the Fir's height growth was < 3 in./year, and the Spruce had overtaken it in height.

286. ARORA, R. K. **Climatic climax along the Western Ghats.** *Indian For.* 86 (7), 1960 (435–9). 7 refs.

An account of the development and succession of vegetation from scrub types to moist deciduous/semi-evergreen forest and to the tropical wet evergreen climax communities, based chiefly on studies in the N. Kanara district.

287. BHATNAGAR, H. P. **Succession in some *Shorea robusta* forests of the U.P.** *J. Indian Bot. Soc.* 39 (1), 1960 (22–6). 11 refs. O.B.D.

Succession studies in the dry and moist *S. robusta* (Sal) types indicate that there is evidence for both progression and regression. The dry types ultimately degrade into a dry grassy savanna, after passing through the mixed miscellaneous stages. The primary succession in the dry Sal type starts from a grassland association with species like *Saccharum spontaneum* and *Erianthus munja*, leading to the mixed miscellaneous stage. This may regress to deciduous forest, or to mixed forest with Sal and finally to dry savanna. In the moist Sal type, the primary succession starts from grasses and leads to mixed forests of Sal and *Terminalia tomentosa*, *Syzygium cuminii* etc., after passing through mixed miscellaneous seral stages. The moist Sal type may, however, degrade to a dry Sal type, then to mixed miscellaneous forest, and ultimately to dry savanna. In localities with a high water-table and under moist conditions, regression may proceed towards savanna with tall grasses. The tall-grass savanna may be more or less stabilized as a sort of post-climax association. [Cf. *F.A.* 22 No. 308.]

182.4. Layer Communities

See also Nos. 25–6, 259, 300.

288. KARPOV, V. G. Opyt èksperimental'nogo rešenija nekotoryh voprosov fitocenologii elovogo lesa. **[An experimental solution of some plant-sociological problems in Spruce forests.]** *Dokl. Akad. Nauk SSSR* 132 (3), 1960 (711–4). 8 refs. [Russ.] A.P.B.

[Cf. *F.A.* 20 No. 4320; 21 Nos. 4159–60.] Discusses the question why nemoral herbaceous species do not occur in the ground layer of taiga communities of the *Piceetum myrtillosum*, and reports experiments in the Vologda region which showed that their absence is attributable to competition by tree roots for available forms of N.

182.5. Synecological Measurements and Methods

289. SOČAVA, V. B. **[Geobotanical mapping: its tasks and importance in developing the national economy.]** *Acta bot. sinica* 8 (2), 1959 (106–17). [Chin.Russ.] C.G.B.

Discusses the topic with reference to China and the U.S.S.R.

290. DEVRED, R. La cartographie de la végétation au Congo belge. **[Vegetation mapping in the Belgian Congo.]** *Bull. agric. Congo belge* 51 (3), 1960 (529–41 + map). 39 refs. [F.du.]

Reviews the work done up to the present and presents a map on a scale of 1 : 1,000,000, incorporating all available information.

187. Vegetation Types

See also Nos. 5, 7, 12–4, 25–7, 37, 40, 42, 46–7, 72, 106, 109, 178, 183, 211–2, 285–8, 317, 909.

291. NEWBOULD, P. J. **The ecology of Cranesmoor, a New Forest valley bog. I. The present vegetation.** *J. Ecol.* 48 (2), 1960 (361–83). 36 refs.

A description based on a vegetation map, maps of the distribution of individual species, and quadrat data from 13 sample sites. Four main vegetation types are recognized: dry heath and variants (closed-canopy *Pinus sylvestris*; *Pteridietum*); wet heath; *Schoenetum*; and general bog communities.

292. ZONNEVELD, I. S. De Brabantse Biesbosch: een studie van bodem en vegetatie van een zoetwatergetijdendelta. **[The Brabant Biesbosch: a study of the soil and vegetation of a freshwater tidal delta. [Vols. A, B, and C].]** Centrum voor Landbouwpublikaties en Landbouwdocumentatie, Wageningen. 1960. pp. 210 + pp. 396 + 17 dgms., gphs., tbls., & maps. 10 pp. of refs. [Du.du.e.]

A detailed study of the area, which lies within the triangle formed by Dordrecht, Breda and Gorinchem. Vol. A comprises the English summary and text

figures and tables, Vol. B the Dutch text and Vol. C the appendices (maps and figures). The vegetation includes considerable areas of Willow coppice, cut on a regular rotation, and some naturally occurring Willow stands.

293. NOIRFALISE, A. Les érablières de ravin en Belgique. **[The ravine Maple forests of Belgium.]** *Bull. Jard. Bot. Brux.* 30 (1), 1960 (37–49). 15 refs. [F.] O.B.D.

Presents data on the distribution, specific composition and ecological characteristics of the following associations: (1) *Acereto/Tilietum*, (2) *Ulmeto/Aceretum*, and (3) *Dryopterideto/Aceretum*.

294. DUVIGNEAUD, J. La forêt alluviale du Mont-Dieu (Vallée de la Bar, Département des Ardennes, France). **[The alluvial forest of Mont-Dieu (Bar valley, Ardennes, France).]** *Vegetatio* 8 (5/6), 1959 (298–332 + 3 tbls., 4 photos). 28 refs. [F.] A.P.B.

Deals with the floristic composition, ecology, systematic position, distribution, economic value and evolution of (1) the *Alnetum glutinosae caricetosum ripariae*, (2) the *Pruneto-Fraxinetum subatlanticum*, (3) the *Querceto-Carpinetum stachyetosum*, describes the development of the flora in clearings where the forest (managed as coppice with standards) is felled ca. every 30 years, and includes short surveys of the flora of the drainage ditches and the bordering meadows.

295. ZODDA, G. Studi sulla flora Teramana IV: Azione antropica sul Bosco del Ceppo (Bosco Martese). **[Studies of the flora of the Teramo region [Abruzzi]. Human influence on the forest of the Ceppo (Martesian Forest).]** *Nuovo G. bot. ital.* 66 (1/2), 1959 (253–64). 9 refs. [It.it.e.] A.P.B.

A description of the original, almost virgin, vegetation (a Mediterranean type of *Fagetum*), the changes brought about by the felling, and the species (largely exotic conifers) used in reforestation.

296. NIKOLOVSKI, T., and CIRIMOTIK, J. Karakteristika na krajbrežnite rastitelni grupacii po srednoto i dolnoto tečenie na r. Vardar (potez Titov Veles—Gevgelija). **[Characteristics of the riparian plant communities of the middle and lower reaches of the Vardar river from Titov Veles to Gevgelija.]** *Godišn. Šum. Inst., Skopje* 3 (3), 1958 (119–49). 12 refs. [Maced.e.]

Major plant associations from the source of the Vardar to the Mediterranean are noted, and an analysis is given of 6 important communities to be found in an idealized cross-section of the valley, rising from the edge of the river to the terrace above the flood-plain. These are: *Polygono-Chenopodietum polyspermum*, *Tamaricetum parviflorae*, *Salicetum albo-fragilis*, *Platanetum orientalis*, *Populetum albae*, and *Populetum nigrae*. An index of 296 species shows the communities in which each plant is present, with an indication of its status.

297. WENDELBERGER, E. Die Auwaldtypen der Donau in Niederösterreich. **[Types of flood-plain forest in Lower Austria.]** *Cbl. ges. Forstw.* 77 (2), 1960 (65–92). 41 refs. [G.]

A detailed plant-sociological description and classification, chiefly of types of the 'hard *Au*', and the 'Hornbeam *Au*' (both sub-associations of *Ulmo-Quercetum*), including secondary communities developing after human interference, such as groups or stands of *Populus alba* after clear felling, of Ash after a selection system, and dry formations, chiefly the result of river training in the Danube valley. [Cf. *F.A.* 21 No. 4195.]

298. SAMEK, V. Vegetační pásmovitost a zvrat pásem se zvláštním zřetelem k rozšíření smrku v nižších polohách. **[Vegetation zones and their inversion, with regard to the distribution of *Picea abies* in hilly districts.]** *Prace Výzkum. Úst. Lesn. ČSR* No. 17, 1959 (219–28 + 1 tbl.). 28 refs. [Cz.russ.g.]

Discusses Russian and German theories on vegetation zonality, and presents a table showing six vegetation 'steps' (zones) from the *Pinus mugo* mountain subalpine zone to the colline Oak zone, indicating for each the main species of plants, the forest type, soil type, and climatic characteristics. Particular attention is paid to the position of Spruce in the scheme.

299. STASZKIEWICZ, J. Zespoly sosnowe Borow Nowotarskich. **[Scots Pine associations from Bory Nowotarski.]** *Fragmenta floristica et geobotanica* 3 (2), 1958 (105–29). [Pol.f.] From *abstr.* in *Biol. Abstr.* 35 (13), 1960 (33643).

Argues that the biotype of *Pinus sylvestris* in this region was probably a special race. The associations described are *Sphagnetum medii*, *Pineto-Vaccinietum uliginosi* and *Pineto-Calamagrostidetum villosae*.

300. SEPP, R. Metsa alustaimestiku osatähtsus loometsade tüpiseerimisel ja loomuldade arenguprotsessis. **[Importance of the forest ground vegetation in the classification of alvar forests into types, and in the development of alvar soils.]** *Eesti NSV Tead. Akad. Toimet. (biol. Seer.)* 9 (2), 1960 (144–66 + 4 photos). 26 refs. [Est.russ.e.*russ.e.*] W.A.H.

Presents data on the amounts of nutrients returned to the soil by the forest ground vegetation, and shows how the characteristic features of the ground vegetation may be used for a detailed classification of alvar forests (i.e. Pine and Spruce forests of low productivity and density, growing on thin rendzinas or alvar soils in the N.W. and N. of Estonia and on Saaremaa). [Cf. *F.A.* 22 No. 489.]

301. BYKOV, S. P. Lesorastitel'nye rajony Moskovskoj oblasti. **[Forest growth regions in the Moscow area.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 34, 1958 (107–14). [Russ.]

Defines and describes the Scots Pine, Spruce, north-western Spruce, Larch and Oak regions.

302. GAEL', A. G., and KAMENECKAJA, I. V. Lesnoe uročišče Ak-Terek na Terskih peskah. **[The Ak-Terek forest outlier in the Terek sands.]** *Trud. Inst. Les.* No. 37, 1958 (193–215). 9 refs. [Russ.]

Describes the climate and soils of the Terek sands round the New and Old Terek rivers which empty into the W. Caspian, and the ground vegetation of the area. Data are given on the heights and rates o

growth of the trees and shrubs, and their suitability for use in the afforestation of sands.

303. PRAVDIN, L. F. Sosna lentočnyh borov Zapadnoj Sibiri. **[The Pine of the 'ribbon-like' forests of W. Siberia.]** *Trud. Inst. Les.* No. 37, 1958 (83–94). 11 refs. [Russ.]

Five clearly defined 'ribbons' of Pine forest, with a total area of 1·8 million ha., run S.W.–N.E. into the steppes between 53° 3′–50° 4′ N. and 83° 8′–80° 0′ E. The indications are that the Pine became established in the post-glacial period. Data on meteorology and climate; forest types; age, site class, density and stocking of Pine stands; peculiarities of cone-bearing, cone morphology, seed weights, needles, growth form, and natural regeneration are presented and discussed for the N. and S. parts of the 'ribbons'. It is concluded that biologically, ecologically, and climatically these outliers are not uniform, and silviculture and management should be adjusted accordingly from N. to S., e.g. ploughing assists natural regeneration in the N., but is useless in the S., where plantations should be helped by planting *Salix acutifolia* var. *caspica* to fix the sands; selection fellings should be done in the S., clear fellings in the N.

304. KÜGLER, F. Waldtypen der sibirischen Lärchen *Larix dahurica* und *Larix sibirica*. **[*L. gmelinii* and *L. sibirica* forest types.]** *Forst- u. Holzw.* 15 (11), 1960 (221–3). [G.]

Using Russian sources, describes 7 forest types for *L. gmelinii* and 8 for *L. sibirica* and presents a yield table for *L. sibirica* in the S. Altai region.

305. TAKASUGI, K. **[On the continuity between the climax communities in the warm-temperate forest region [of Japan].]** *J. Jap. For. Soc.* 40 (12), 1958 (505–8). 5 refs. [Jap.jap.e.]

Presents a table showing the distribution trends of the major tree species (dominants and constants) in the forest region of S.W. Shikoku, by which community types may be recognized. A remarkable continuity of associations was found, presenting a simple altitudinal sequence.

306. ZOHARY, M., and ORSHAN, G. **The *maquis* of *Ceratonia siliqua* in Israel.** *Vegetatio* 8 (5/6), 1959 (285–97). 10 refs. [E.e.] A.P.B.

Presents data on the floristic composition, distribution and ecology of 3 associations of the alliance *Ceratonio-Pistacion lentisci* which occupies the lowest zone of the Mediterranean mountain maquis.

307. ZOHARY, M. **The maquis of *Quercus calliprinos* in Israel and Jordan.** *Bull. Res. Coun. Israel* 9*D* (2), 1960 (51–72 + 2 tbls.). 14 refs. [E.e.]

Proposes a subdivision of the E. Mediterranean vegetation into eu-, oro-, and sub-Mediterranean zones, and discusses the position of the *Q. calliprinos/Pistacia palaestina* maquis association within the eu-Mediterranean zone. Three subassociations are distinguished: *galilaea*, *typica* and *depauperata*. An analytical table is presented of the components of the association; its abundance of species is a result of human interference. Stratification, life forms, phenoecology, root habits, regeneration, water relations and heat tolerance are also discussed. Over 70% of the components of the association belong to the E. Mediterranean element or to the E. Mediterranean-Irano-Turanian group. Observations are made on the syngenesis of the association and on the recovery of the climax after destruction by man.

308. KHAN, M. A. W., and GUPTA, A. C. **Plant communities associated with Sal (*Shorea robusta*) regeneration in Dehra Dun valley.** *Indian For.* 86 (7), 1960 (417–23). 4 refs.

A detailed phytosociological study in Champion's B3-type forest, with a chart and profile, indicating a fairly stable sub-climax and the importance of eliminating at least the dense shrubby layer before Sal regeneration can be established in quantity. [Cf. *F.A.* 22 Nos. 287, 343.]

309. PURI, G. S., and JAIN, S. K. **The study of dry scrub vegetation under forest management at Dhond, Poona.** *Proceedings of the National Institute of Sciences of India, New Delhi* 24 *B* (3), 1958 (145–9 + 6 photos). 3 refs. O.R.S.

The area studied has been closed to grazing for 7 years and, except for the planting of blocks of *Acacia* spp., there has been no biotic interference since then. Plants present are listed and grouped by heights (2–2·5 m., 0·75–2 m., 0·5–1 m., 0·1–0·5 m., prostrate or decumbent).

310. CHAVAN, A. R., and SABNIS, S. D. **Along the banks of the river Vishwamitri (a floristic study).** *Indian For.* 86 (8), 1960 (469–74). 7 refs.

A study of the flora and seasonal changes in vegetation along the Vishwamitri, Baroda, with changes in river water level, listing 151 plants, 35 of which form the 'upper storey' of trees and shrubs.

311. KINGDON-WARD, F. **A sketch of the flora and vegetation of Mount Victoria in Burma.** *Meddelanden från Göteborgs Botaniska Trädgård* (*Acta Horti Gotoburgensis*), *Göteborg* 22, 1959 (53–74 + 8 plates). 6 refs. [E.] L.S.

The three vegetation types recognized are (1) tropical semi-evergreen forest (monsoon forest), up to 3500 ft.; (2) sub-tropical evergreen forest (including Champion's sub-tropical Pine forest), 3500–6500 ft.; and (3) temperate semi-evergreen forest, 6500–10,000 ft.

312. TRAPNELL, C. G., and GRIFFITHS, J. E. **The rainfall-altitude relation and its ecological significance in Kenya.** *E. Afr. agric. J.* 25 (4), 1960 (207–13). 8 refs.

The vegetation types of S. Kenya have been found to fall into three separable climatic series in the range between higher-and-moister and lower-and-drier conditions. The lines dividing these sequences have been drawn on a small-scale map, and in the main correspond remarkably closely to the 6-in. isogram. This relationship may be regarded as a first approximation to one of rainfall and temperature, and its significance is discussed. *From authors' summary.*

313. HUECK, K. Los bosques de *Polylepis sericea* en los Andes venezolanos. [**The *P. sericea* forests in the Venezuelan Andes.**] *Bol. Inst. For. Latino Amer., Mérida* No. 6, 1960 ([i–ii], 1–33 + 4 photos). 24 refs. [Span.span.e.]

Presents information on the area covered by *Polylepis sericea* in South America as a whole, and in Venezuela in particular, the ecology of the forests, with particular reference to climate and species composition; and natural regeneration. The *P. sericea* forests of Venezuela are found in the highlands of Mérida in the form of small islands within an altitudinal zone having an upper limit of 4200 m. and a lower limit bounded by the Andean cloud forest. *P. sericea* has a well developed root system and in consequence the forests are most important for their role in soil conservation. Their exploitation for fuel and grazing should therefore be banned and the forests protected. Natural regeneration is sufficient to ensure their continuity.

314. SCHULZ, J. P. **The vegetation of Suriname: a series of papers on the plant communities of Suriname and their origin, distribution and relation to climate and habitat. Vol. II. Ecological studies on rain forest in northern Suriname.** *Repr.* from *Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen, Afdeling Natuurkunde (Ser. 2), Amsterdam* 53 (1), 1960. pp. 267 + 4 photos. 118 refs. [E.e.span.]

Presents data from studies of climatic factors (humidity, temperature), edaphic factors (soils of different regions, and soil moisture and air), species composition of the upper, middle and lower storeys and the undergrowth (including a comparison with similar studies for British Guiana and Brazil), and regeneration (diameter-class distribution, germination and distribution of seedlings in closed forest, girth increment of upper-storey species, horizontal distribution of the species, and succession in small and large openings). Gives details of an experiment on the effect of poisoning undesirable species in the Mapane forest [cf. *F.A.* 20 No. 3174].

315. WOMERSLEY, J. S. **New Guinea vegetation.** *Australian Museum Magazine, Sydney* 12 (12), 1958 (384–8). L.S.

Recognizes and describes the following formations in the drained lowland tropical forest: (1) *Octomeles sumatrana* and *Eucalyptus deglupta* forests; (2) monsoon forests; (3) lowland drained rain forest; (4) lowland ridge forests, and forests on poor soils.

2. SILVICULTURE

See also Nos. 214–5, 555.

316. **A handbook of silviculture for West Bengal.** *W. Bengal For. Bull.* No. 7, 1959. pp. 49.

317. MIYOSHI, S. [**Studies on the management of Kashi (*Cyclobalanopsis*) and Shii (*Shiia*) evergreen broadleaved forest in their native region.**] *Bull. Miyazaki Univ. For.* No. 3, 1959. pp. 141 + 5 plates. 192 refs. [Jap.e.]

Presents results of investigations on stand structure, growth, regeneration, and working methods in natural, mixed, evergreen broadleaved forests in the Miyazaki district. Extensive tables and graphs are given [in Japanese only].

318. MAGYAR, J. Bükkfatermesztésünk föbb elvei. [**The fundamental principles of the silviculture of Beech in Hungary.**] *Erdészettud. Közl., Sopron* 1959 (2), (77–128). [Hu.]

319. De populier. [**The Poplar.**] *Ned. Bosb. Tijdschr.* 32 (5/6), 1960 (143–234). [Du.]

Contains the following papers, most with English summaries: Problems in Poplar-growing (*H. A. van der Meiden*) [discusses choice of site, establishment of plantations, the use of Poplar in combination with other tree species or with agricultural crops, tending, and timber quality]; Provenance and nomenclature of some Poplar cultivars [sold in the Netherlands] (*J. T. M. Broekhuizen*; 8 refs.); The problem of Poplar cultivars and clones (*H. A. van der Meiden* and *J. F. Wolterson*; 8 refs.) [describes and discusses the results of a survey since 1954 on desirable clones and concludes that the cultivars sold and certified under control by the N.A.K.B. (Netherlands General Inspection Board for Arboriculture) are sometimes inferior and should be replaced; also emphasizes that cultivars should be monoclonal and that after selection of the best clone a detailed clone description, including data on disease resistance, must be made]; Choice of planting material (*H. A. van der Meiden* and *J. L. F. Overbeek*; 6 refs.) [presents the results of field trials of cuttings, setts, and one- and two-year rooted plants (one-year scions on one-year stocks and two-year scions on two-year stocks), concluding that one-year plants generally give best results and are most economical, but that two-year plants may be used where larger material is desirable, e.g. along busy roads]; A method of controlling *Cryptorrhynchus lapathi* on Poplar (*J. C. Onrust* and *J. C. Roersch*) [by coating the stems with various insecticides; Ekatin (thiometon) gave the best results of the insecticides tested, at a mean cost per tree of Fl. 0·16 for the material and Fl. 0·36 for examination and application]; The future of Poplar wood (*K. Griffioen*); Origin and activities of the National Poplar Commission (*F. W. Burger*); and the tenth session of the International Poplar Commission, Venice and Turin (*F. W. Burger, G. Hellinga* and *H. van Vloten*). [Cf. *F.A.* 22 No. 481.]

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 70, 325, 332–4, 342.

320. JUNAŠ, G. G. Lesovodstvennoe značenie rubok glavnogo pol'zovanija v stepnyh lesah. [**The importance of principal fellings in steppe forests.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (175–98). [Russ.]

In the light of the fact that principal fellings have been forbidden in steppe forests since 1949, discusses the management and condition of these forests, and argues that, in order to preserve and improve them, principal fellings should be made and poor stands (especially Ash) replaced.

321. WYATT-SMITH, J. **Survival of isolated seed-bearers.** *Malay. Forester* 23 (2), 1960 (133–4).

Observations have been made on the survival and condition of 74 isolated trees of economic species left standing in 1945 on an area which was clear felled and burned, cultivated for one crop, and then abandoned. In 1953, 42 trees (57%) out of the original 74 were still alive. In 1959 only 24 (32%) survived; 12 of these were healthy but the remainder were suffering from root and butt rots and are unlikely to survive many more years. Eleven of the casualties (presumably the better and healthier trees) had been illegally felled.

322. BØHMER, J. G. Bledningsskogen på ny i søkelyset. **[Selection forest in the limelight again.]** *Norsk Skogbr.* 6 (13/14), 1960 (449–51). [Nor.]

[Cf. *F.A.* 21 Nos. 2941, 2952.] Presents further data covering 20–30 years on volume and volume increment in selection forest.

323. CESTAR, D. Prirast i vrijeme prelaza s obzirom na način gospodarenja. **[Increment and recruitment period with respect to the silvicultural system.]** *Šum. List* 84 (5/6), 1960 (173–7). 9 refs. [Croat.e.]

The high m.a.i. of Silver Fir (4·84%) and Beech (2·2%) in a 204-ha. area of *Fagetum croat. abietetosum* selection forest was attributed to the group structure of the forest. This reduced the recruitment period of young growth (thus increasing diam. increment), and produced stems of better quality because closer grown. The group selection system should, however, be introduced only where groups of Fir or Beech regeneration already exist. Clearing areas for the formation of groups is undesirable, because Beech will be favoured and the proportion of conifers consequently reduced. [Cf. *F.A.* 16 No. 3937.]

222. Coppice, Pollarding and Lopping Systems

See also Nos. 345–8.

324. Atti del convegno nazionale del bosco ceduo, con particolare riguardo alla macchia mediterranea. **[Proceedings of the national conference on coppice woodlands, with particular reference to the Mediterranean maquis.]** Camera di Commercio Industria e Agricoltura di Siena, Siena. 1959. pp. 441. [It.]

The conference was held in Dec. 1958. The following papers (with discussions) are included: Statistical-economic illustration of Italian coppice production (*V. Bellucci*); The improvement of coppice from the forestry point of view (*A. Pavari*); The traditional uses and use as building material, of the Mediterranean maquis, with particular reference to costs of harvesting and transport (*G. Giordano*); Possible chemical utilization and pulping of coppice (*C. Centola*); A proposed reform in the method of taxing returns from coppice woodland (*E. d'Albergo*); Some statistics of coppice in Italy (*L. Maroi*); Coppice woodland and the cultivation of quick-growing trees for industrial purposes (*G. Piccarolo*); Experiments in weed control in connexion with afforestation of scrubland in Lombardy (Cartiera Vita Maier & C.); Reconstituted wood (*E. Cianetti*); Dry distillation of wood in a very simple continuous-process plant (*M. Graziani*); Plant for dry distillation of wood (*M. Graziani*); Charcoal and wood gas (*M. Graziani*); The Isogrand process [for semi-chemical pulping of hardwoods] (*L. Grand*) [cf. *F.A.* 16 No. 3568]; Improved mechanical pulp from mixed hardwoods (*P. Flamant*); Economic aspects of the utilization of hardwoods in Italy (*M. Cornillat*); Coppice woodlands in France: their present and future utilization (*A. Villière*); Semi-commercial experiments in the utilization of coppice woodland for pulp and paper manufacture (*J. Arguillère*); Present state of development of the Delbay nitric-acid process [for pulping unbarked coppice wood] (*G. Desorbay* and *P. Delcroix*); Some general considerations on the use of nitric acid in pulping (*J. Chedin*); Use of coppice hardwoods in the paper-making industry (*E. G. Voiret*); New possibilities in the use of Beech for semi-chemical pulp (*G. de V. Piscicelli*); The improvement of coppice from the forestry point of view (*F. Girino*); Semi-chemical pulp from coppice for the manufacture of newsprint (*F. Pancirolli* and *G. Ceraglio*); The improvement of coppice in the Marches (*M. Michelangeli*); The Scholler pulping process (*H. Scholler*); The pulp problem and the crisis of coppice woodland in Italy (*A. Mandò*); The yield of coppice woodlands in Tuscany (*G. Bosetto*).

226. Changes of Silvicultural System. Conversion (by System or Species)

325. HATCHER, R. H. **Management of a Red Spruce, Balsam Fir and Yellow Birch stand—1935 to 1959.** *Pulp Paper Mag. Can.* 61 (6), 1960 (168–71). 2 refs.

The objects of management in an uneven-aged stand at Valcartier, Quebec, were to harvest the excess of mature and over-mature Fir, and to permit satisfactory development of advance growth and new regeneration by improving the light conditions. This was to be achieved without heavy wind damage in the residual stand, and without increasing the volume of less valuable species. These objects were attained by an initial heavy cut (1935/36), two moderately heavy cuts (1953, 1954) and a light cut (1958), and the stand is now suitable for a selection system of felling. Results from plot measurements in 1938, 1950, 1954 and 1959, are presented in tables and graphs.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 114–5, 314, 484–5, 518, 916, 921, 923, 928.

326. POLIKARPOV, N. P. Formirovanie sosnovyh molodnjakov c raznyh tipah lesa južnoj tajgi evropejskoj časti SSSR. **[The development of Scots**

Pine sapling stands in different forest types of the southern taiga in European Russia.] *Soobšč. Inst. Les.* No. 9, 1958 (33–52). 3 refs. [Russ.]

Regeneration was sampled in young Pine/broad-leaved stands (age classes 5–7, 10–12, 19–21) originating after clear fellings in the *Pinetum myrtillosum* and *P. tiliosum* in Vologda province. In some of the stands the Pine predominated, in others the broad-leaved species. From measurements on > 60,000 trees and analysis of 1090 sample trees, tabulated data are given on stand composition and constitution; height and diameter growth by species; the weight of the aerial parts by species; etc.

327. POPOV, V. V. Zakonomernosti rosta i formirovanija dubrav v uslovijah severnoj lesostepi. **[Trends in the growth and development of Oak stands in the northern forest-steppe zone.]** *Soobšč. Inst. Les.* No. 10, 1958 (3–24). [Russ.russ.]

Describes the seven most important forest types in which Oak occurs in this region. Five phases in the growth of hardwood stands are distinguished and described: (1) establishment; (2) further development until the canopy closes; (3) active development in stand structure and composition; (4) maturity, with stable stand structure and composition; and (5) ageing and dying. On the basis of these patterns in growth and stand development, a system of silvicultural measures is worked out, designed to produce Oak stands of yield better than that of site class II.

23. Regeneration and Formation of Stands

231. Natural Regeneration

See also Nos. 73, 83, 267–8, 303, 308, 314, 396, 656, 858–9.

328. BEAUFAIT, W. R. **Studies on fire and other factors related to Jack Pine regeneration in northern Lower Michigan.** *Abstr. of thesis*, in *Dissert. Abstr.* 20 (12), 1960 (4478). O.R.S.

A series of studies was made on the effects of high temperatures on cones and seeds in the laboratory, and of burning vs. scarification on seedling growth and germination in the field. Mature cones responded consistently to high temperatures by opening in a range from 80 seconds at 200° F. to two sec. at 1300°. Ignition time ranged from 60 sec. at 700° to 2 sec. at 1300°. Those that ignited retained no viable seeds, whereas seeds of unignited cones suffered little reduction in germinative capacity. Results of tests of site scarification with slash scattering showed that only 3 of the 170 acres involved were supporting as many as 1000 seedlings per acre. Twenty old wildfire areas were also inspected. This survey suggested that any prescribed fires should have an aerial source of seed, be scheduled to permit seedling establishment and have provision for minimum shading of new seedlings. Seeds (three sowing dates) and seedlings (1 + 0 and 2 + 0) were grown at two locations under three light intensities (full, ¾ and ¼) and on three site treatments (scarified, burned and untreated) for two years. Scarified plots gave best survival (13·8 to 12·1%) in the second year, with little difference between burned and untreated plots (1·0 to 6·9%); higher survival was related to the presence of some shade to protect the germinating seedlings. Two preliminary slash-burning trials tested fire behaviour and effectiveness of mineral-soil exposure in different burning conditions; apparently Jack Pine slash burning can be safely carried out to produce the desired mineral-soil exposure. In two additional field tests, 19 and 24 phenotypically desirable seed-trees were left standing, giving 18 and 25% stocking by milliacres; these results were for one, exceptionally dry, growing season only, and additional regeneration may be expected in subsequent seasons.

329. BEAUFAIT, W. R. **Use of a military flame thrower to open cones in standing Jack Pines.** *J. For.* 58 (7), 1960 (562–3).

Tests have been made in the use of an M2A1 portable flame-thrower on the crowns of standing *Pinus banksiana* seed-trees, to induce the resin-sealed cones to release their seeds. This device may be used in circumstances where broadcast burning is too hazardous or is otherwise unsuitable as a silvicultural tool. The test was made when snow covered the ground and air temperature averaged 5° F. The flame-thrower was charged with equal volumes of waste crankcase oil and petrol, with initial tank pressure of 2000 lb./sq. in. An ignited stream of this heavy fuel was directed at the crowns; a 4-second blast was required to open cones at a height of 50 ft., and 2 trees could be treated with each filling. Total germination % of seed from cones opened in this way was normal, and vegetative buds were not injured, though needles were scorched and covered with soot.

330. IVANENKO, B. I. Tipy lesa Krymskoj sosny, ee estestvennoe vozobnovlenie i meroprijatija po vosstanovleniju. **[*Pinus nigra* var. *caramanica* forest types: natural regeneration and rehabilitation measures.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Naučč.-Issled. Inst. Lesovod.* No. 34, 1958 (99–107). 1 ref. [Russ.]

Describes the characteristics of six *P. n.* var. *caramanica* forest types in the mountains of the Crimea, and regeneration in them. On this basis the author recommends: (1) an extended planting programme covering clear fellings, stony slopes, etc.; (2) the conversion of coppice Oak forests in the zone at 400–800 m. alt. by planting the Pine in strips; (3) assisting natural regeneration in existing stands by screefing and tillage, and by removal of thick scrub; and (4) tending operations to favour the Pine in mixed stands.

331. BRAATHE, P. Mosedekkets og humusdekkets virkning på spiring og utvikling av granplanter. **[The effect of the moss and the humus layers on germination and development of Spruce.]** *Norsk Skogbr.* 6 (13/14), 1960 (463–5). [Nor.]

Presents results of a survey in 1959 of experiments begun in 1953–54, some of which have already been described [see *F.A.* 17 No. 3730]. Removal of the moss (*Hylocomium schreberi*, *H. splendens*, *Hypnum crista-castrensis* and *Dicranum scoparium*) increased the numbers of plants at the survey to 24 times, and removing the humus, or mixing it with the mineral

soil, to 268 and 173 times respectively, that on untouched plots. The poor results on the plots with moss and humus intact are due partly to lower germination and partly to high mortality in the following year. Mean height of plants was 4·3 cm. on plots with moss or humus intact and 6·7 cm. on cultivated plots.

332. Pobedinskij, A. V. Lesovozobnovlenie na koncentrirovannyh vyrubkah elovyh drevostoev Jaroslavskoj oblasti. [**Regeneration on concentrated clear fellings in Spruce stands in the Yaroslavl region.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 34, 1958 (19–40). [Russ.] 12 tbls.

[Cf. *F.A.* 20 No. 1634.] An account of regeneration, and measures to assist it, on clear fellings in the *Piceetum oxalidosum* and *P. myrtillosum*.

333. Kasimov, V. D. Vyživaemost' elovogo podrosta na koncentrirovannyh vyrubkah. [**Survival of Spruce advance growth on concentrated fellings.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (10–8). [Russ.]

[Cf. *F.A.* 22 Nos. 858–9.] Mortality was greatest in the first 2–3 years after felling. Advance growth (a.g.) took up to 6 years to recover, and was slower on *Piceetum oxalidosum* than on *P. myrtillosum* sites. Under a dense canopy ($\geqslant 0{\cdot}8$) a.g. almost all died after the felling, but could survive under a canopy of density 0·4–0·6. A.g. up to 30 years old that had suffered mechanical damage could recover in 1–3 years, but the recovery of damaged a.g. 40–60 years old was doubtful. In assessing the capability of Spruce a.g. to survive, the decisive factor is its age, not its height.

334. Saharova, A. S. Vozobnovlenie eli na koncentrirovannyh vyrubkah v gorno-lesnyh rajonah Baškirskoj ASSR. [**Spruce regeneration on concentrated fellings in the montane forest regions of the Bashkirian ASSR.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 34, 1958 (40–6). 1 ref. [Russ.]

An analysis of regeneration on 'concentrated' clear fellings in montane Spruce forests showed that natural regeneration of Spruce was unsatisfactory and needed to be supplemented by direct sowing. Direct sowing on burns and skidding trails gave satisfactory survival on N. and W. aspects; on sites where air temperatures were too high, sowing *Epilobium angustifolium* as a cover crop with the Spruce gave satisfactory results.

335. Pozdnjakov, L. K. Estestvennoe vozobnovlenie daurskoj listvennicy v bassejne reki Jany. [**The natural regeneration of *Larix gmelinii* in the Yana basin [Yakutia].**] *Trud. Inst. Les.* No. 37, 1958 (95–107). 4 refs. [Russ.]

Tabulates data on the frequency of seed-years, seed quantity and quality, dispersal distances, times of seed-fall, the relation of r.h. and wind direction to seed-fall, and the numbers and height classes of natural regeneration in the 6 different Larch forest types and on clear fellings in them.

336. Čarkina, A. P. Lesovosstanovitel'nye processi v perestojnyh dubravah zapretnoj polosy r. Volgi v Čuvašskoj ASSR. [**Regeneration in overmature Oak forests of the reserved belt along the Volga in the Chuvash ASSR.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 34, 1958 (46–61). [Russ.]

Analyses the regeneration on felled areas (usually satisfactory) and under canopy (mainly unsatisfactory) for the various forest types. Silvicultural and management measures are outlined to improve regeneration where necessary.

337. Nikitin, V. V. Vlijanie izreživanija materinskogo pologa na sohranenie i razvitie jasenevogo podrosta. [**Effect of thinning the parent stand on the survival and development of Ash advance growth.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (30–46). [Russ.]

Studies were made in 1953 in the forest-steppe zone in a 3-storeyed Oak/Ash stand, 95 years old, with some Lime, Maple and Elm. Various plots had been given different thinning treatments in 1947. It is concluded that to ensure and preserve advance growth of Ash the underwood should be removed 6–8 years, and the second storey 3–4 years, before the final felling; thinning the top storey is unnecessary.

338. Badea, M., Constantinescu, N., and Mihalache, V. Caracteristici ale regenerării făgetelor situate în condiţii staţionale extreme. [**The regeneration of Beech stands in extreme site conditions.**] *Rev. Pădurilor* 75 (3), 1960 (138–42). 6 refs. [Rum.russ.g.f.e.]

The regeneration of Beech at the limits of its climatic range in Rumania has been impeded by unusually deficient rainfall and low winter temperatures during recent years. Experiments have shown that regeneration is much more successful if (*a*) the forest floor is scarified before seed-fall and (*b*) the mast is covered by harrowing before the severe frosts set in.

339. Le Pont, P. Les hormones végétales auxiliaires du forestier pour la régénération naturelle des futaies régulières de hêtre. [**Growth regulators as aids to the forester in the natural regeneration of even-aged Beech high forest.**] *Rev. for. franç.* 12 (8/9), 1960 (572–80). [F.]

Describes experiments in the chemical control of brambles in the Forêt d'Eawy, using esters of 2,4-D and 2,4,5-T alone or in various combinations, all of which gave satisfactory results. It is estimated that the maximum cost of treatment in heavily infested stands, in 1960, would be NFr. 150/ha. Soil scarification, which is advisable after spraying, costs a further NFr. 70/ha.

340. Linden, G., and Immel, R. Versuche zur Bekämpfung von Wald-Bingelkraut mit Herbiziden. [**Control of *Mercurialis perennis* with herbicides.**] *Allg. Forstzeitschr.* 15 (27), 1960 (384–5). [G.g.]

Various herbicides were tried in June, 1959, in Beech stands in Hesse aged 130–150 years, where this weed hampered natural regeneration. Aminotriazole (10 kg./ha.) killed all ground vegetation,

and no *Mercurialis* was present in spring 1959 or spring 1960. Celatox P (CMPP = 4-chloro-2-methyl-phenoxypropionic acid) was toxic to *Mercurialis* but less so to other plants; in two tests, 2·5–3 litres/ha. gave 80–100% control of *Mercurialis*, in two others, 3·5 litres were required. Concentrated mist spraying using 200 litres water/ha. was as effective, with both preparations, as a coarser spray of 1000 litres. Dowpon, TBA, and TBA + 2,4,5-T were not satisfactory. Beech seedlings sprang up on all plots, but were killed by frost.

341. TRYON, E. H., and CARVELL, K. L. **Environmental factors affecting Yellow-Poplar survival under a young stand.** *Castanea* 25 (2), 1960 (69–73). 1 ref.

Lack of reproduction under a 30-year stand of *Liriodendron tulipifera* in northern West Virginia that produces heavy seed crops annually, is attributed to a matted humus layer that tended to prevent seed from germinating, and to low light intensity, resulting in succulent seedlings, most of which died during the first growing season. Seedlings surviving till winter were killed by low temperature or smothered by the heavy fall of leaves.

342. LAL, K. B. M. **Manipulation of undergrowth for aiding natural regeneration of evergreen and semi-evergreen forests.** *Indian For.* 86 (7), 1960 (414–6).

Experience in Upper Assam suggests that the uniform system may be successfully introduced if used in conjunction with selective weeding, rather than complete clearing of the shrub layer. If only those species that interfere with regeneration are removed, the remaining shrubs keep down creepers, climbers, and other competitors, permit the opening of the canopy, keep the ground soft and moist, and prevent the damaging effect of drip. Improved growth of regeneration ensues. It was found that Naga workers rapidly became efficient at this apparently complicated work.

343. SETH, S. K., and KHAN, M. A. W. **An analysis of soil moisture regime in Sal (*Shorea robusta*) forests of Dehra Dun, with reference to natural regeneration.** *Indian For.* 86 (6), 1960 (323–35 + 1 photo). 14 refs.

Dehra Dun Valley Sal forests, conforming to Champion's B-3 High Level Alluvium Type, characteristically reproduce freely, but sometimes the reproduction is deficient, particularly in areas which are rigidly fire-protected [cf. *F.A.* 22 No. 308]. The long history of forest management and protection has led to conditions under which large tracts of these forests are not reproducing adequately. The existing conditions have, therefore, been investigated with regard to seed-source, seedbed conditions, climate, light, moisture, nutrient requirements and the ameliorative effects of fire. In particular an analysis of the soil moisture regime has been made and correlated with the various developmental stages of Sal seedlings. Suggestions have also been made with regard to adoption of suitable forestry practices to achieve regeneration *de novo* and to promote the timely establishment of Sal seedlings. It is concluded that if the manipulation of Sal forests is carried out in a manner conforming to the climato-ecological requirements of Sal seedlings, a regeneration period of 15 to 30 years should suffice to restock the area with established Sal regeneration. *Authors' summary.*

344. SETH, S. K., and DABRAL, S. N. **Characteristic features of natural regeneration under various tending schedules in Hollong-Nahor (*Dipterocarpus-Mesua*) forests of Assam.** *Indian For.* 86 (6), 1960 (355–73). 6 refs.

A study was made of natural regeneration of *Dipterocarpus* and *Mesua* spp. in (*a*) unmarked virgin forest, (*b*) forest that had been exploited 5–10 years previously but not tended since, and (*c*) forest exploited 5–10 years previously, in which opening of the canopy, climber cutting, etc. had been carried out intermittently since. The effect of crown cover on height growth of seedlings, and the distribution of natural regeneration in (*a*), (*b*) and (*c*) were studied on a large number of quadrats, and the results statistically analysed. The beneficial effect, and indeed the necessity, of tending operations were fully confirmed.

345. **Short term tree cropping.** *Extr.* from *Rep. E. Afr. Agric. For. Res. Organ. 1959*, 1960 (74).

An experiment to test the effect on stool mortality of felling at ground level (*a*) by axe and (*b*) by saw, a 6-year-old crop of *Eucalyptus saligna* showed that, 6 months after felling, the (*a*) felling had coppiced 94% and the (*b*) 100%. Conversion of fuelwood by axe, instead of saw, wastes 10–20% of the fuel.

346. **Silviculture: *Eucalyptus saligna*.** *Extr.* from *Rep. Dep. For. S. Afr. 1957/58*, 1960 (12–3).

A coppice experiment was laid out to determine the variations in growth and production when one, two, or more shoots were left to grow after clear felling *E. saligna*, all treatments being replicated on (*a*) unburnt sites, and (*b*) sites on which all logging debris had been burnt. After 5 years the following conclusions were drawn: (1) growth was only slightly better on (*a*) than on (*b*) plots; (2) in (*a*) there was no longer any significant difference in d.b.h. between plots with one shoot per stump and plots that had been replanted; (3) in (*a*) plots there was no longer any significant difference in d.b.h. and height between 2 shoots and an unlimited number of shoots per stump; (4) there was no difference in total volume between any of the treatments.

347. HARITONOVIČ, F. N. Poroslevoe vozobnovlenie jasenej. [**Coppice regeneration of Ash.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 34, 1958 (61–99). [Russ.russ.]

Discusses, for *Fraxinus excelsior* and *F. pennsylvanica*, the numbers and position of dormant buds; their growth, and the growth of the coppice shoots; the influence of the size, age and condition of the parent tree and of time of felling upon coppice regeneration.

348. SMIRNOV, V. V. Vegetativnoe razmnoženie osiny v nagornoj časti Tellermanovskoj rošči. [**Vegetative regeneration of Aspen in the upland part of the Tellerman forest.**] *Trud. Inst. Les.* No. 40, 1959 (5–52). 44 refs. [Russ.russ.]

On dark-grey, clay-loam forest soils, Aspen does not form a tap root. The root system is superficial, with horizontal roots near the surface spreading out a long way from the stem. There are also horizontal roots at depths down to 1 m. The area occupied by the root system is considerably greater than that of the crown projection. Some sinkers go down vertically from the horizontal roots, and vertical anchoring roots are also formed near the stem. Root grafting often occurs between trees. Under favourable conditions the roots in the top 20 cm. of soil will produce numerous suckers—200,000/ha. after clear felling a mature stand, and up to 73,000/ha. after an intensive cleaning in a young stand. The formation of suckers is discussed; for suckers to appear from dormant buds, the following conditions are necessary: good aeration and shallow location of the roots; thin root bark and small root diameter; sufficient soil moisture; sufficient warmth. The rate of height growth of suckers is discussed, and compared with that of coppice shoots.

232. Artificial Regeneration

349. **Provisional method for the testing of machines for afforestation.** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech.* No. *LOG/WP.*3/20, 1960. pp. [27]. Limited distribution.

Covers all types of plough, planting machines, augers, rotary borers etc.

350. *Araucaria* spp.: caractères sylvicoles et méthodes de plantations. [***Araucaria* spp.: silvicultural characters and plantation techniques.**] *Bois For. Trop.* No. 72, 1960 (23–9). 21 refs. [F.]

Describes plantation techniques practised in Brazil, New Caledonia, East Africa,and Madagascar.

351. Góis, E. da S. Reis. Évolution des techniques de plantation des *Eucalyptus* au Portugal. [**The development of plantation techniques for Eucalypts in Portugal.**] [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/*60-3*g*.2, 1960, pp. 7. [F.] Limited distribution. [Cf. *F.A.* 22 No. 373.]

352. Hussain, T. **Progress report on Teak forestry in Pakistan 1957/1959.** [*Docum.*] *3rd Sess. FAO Teak Sub-Comm., New Delhi 1960* No. *FAO/TSC*-60/2.8, 1960. pp. 6. Limited distribution.

353. Suttie, W. R. **Progress report on Teak forestry in the Territory of Papua and New Guinea.** [*Docum.*] *3rd Sess. FAO Teak Sub-Comm., New Delhi 1960* No. *FAO/TSC*-60/2.7, 1960. pp. 5. Limited distribution.

232.1. Choice and Trial of Species, Races etc.

See also Nos. 237–8, 295, 302, 487–9, 491, 494, 535, 541–3.

354. Bauger, E., and Smitt, A. Et treslags- og proveniensforsøk på Stad. [**Species and provenance trial on Stad.**] *Medd. Vestland. Forstl. Forsøkssta.* 11 (2), No. 34, 1960 (59–121 + 40 photos, 1 dgm.). [Nor.e.]

In 1922 and 1924, various species and provenances were planted at Drage on the peninsula of Stad in W. Norway, in a study of species possibly suitable fo coastal areas. The site is very exposed to wind and storms, but the soil is rather too poor for some of the species tried. Tree heights were measured in 1959 and results are tabulated and discussed. Sitka Spruce gave the most promising results; although most of the soil in the experimental area was too poor for it, it grew well and proved able to withstand wind when growing on good, deep soils with sufficient moisture; an Alaskan provenance gave better results than one from British Columbia. *Pinus contorta* is considered worth further trial, preferably with a more northerly provenance than that tested (Kimsquit, British Columbia). *Pinus mugo* var. *arborea* is in poor condition, partly as a result of attack by *Lophodermium pinastri*, and it appears to have stopped growing. The other species tried (*Pinus sylvestris, Picea abies, P. pungens* and *Chamaecyparis nootkatensis*) are considered quite unsuitable for the Norwegian coasts.

355. Lamberts, D. De geschiktheid van de zandgronden voor het naaldhout. [**The suitability of sandy soils for conifers.**] *Pédologie, Gand* 9, 1959 (28–34). 9 refs. [Du.f.] O.R.E.

Discusses the effect of depth of water-table and mineral nutrients on the height growth of conifers on sandy soils. It is concluded that the higher-yielding species such as Douglas Fir, *Tsuga heterophylla, Pinus strobus, Abies grandis* and Japanese Larch should be tried, as well as the traditional species—Scots and Austrian Pines.

356. Antonietti, A. Possibilità di usare esperienze d'altri paesi nella scelta delle essenze forestali da adoperare per la ricostituzione boschiva della zona castanile ticinese. [**Prospects of using the experience of other countries in the selection of suitable species for the rehabilitation of the Chestnut zone of the Ticino.**] *Schweiz. Z. Forstw.* 111 (7), 1960 (361–77). 24 refs. [It.g.]

Makes recommendations for species to be tried, based largely on Italian literature of pre-war or early war years on successful introductions under comparable ecological conditions.

232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

See also Nos. 199–202, 218, 239, 354, 529, 893, 896, 924.

357. Lewis, R. E. A. **Atlas Cedar: a forest tree.** *Quart. J. For.* 54 (3), 1960 (291–2).

[Cf. *F.A.* 21 No. 2976.] Gives details of the performance, including volume increment, of two small plantations: (*a*) ca. ½ acre, established in 1904 in Sussex; (*b*) ¼ acre, established in 1932 at Bedgebury. Since planting, m.a.i. has been 132 H. ft./acre in (*a*), and 40 H. ft./acre in (*b*).

358. Maury, R. Le reboisement de la Forêt de Bédoin et son enseignement. [**The reforestation of the Forest of Bédoin and the lessons to be learnt from it.**] *Ann. Éc. Eaux For. Nancy* 17 (1), 1960 (119–53). 9 refs. [F.e.g.]

Describes the afforestation of Mont Ventoux, a rocky, calcareous fore-alp in Provence, carried out

about 1880, mainly with *Cedrus atlantica*, *Pinus nigra* var. *austriaca*, *Quercus ilex* and *Q. lanuginosa*. The financial aspects of the plantations are discussed in detail, and notes are given on the performance of a number of other species tried. [Cf. *F.A.* 17 No. 1538.]

359. GRANDJOT, W. Die atlantische Zeder (*Cedrus atlantica*) in der Provence. [***C. atlantica* in Provence.**] *Forst- u. Holzw.* 15 (11), 1960 (216–8). [G.]

A short account of the site (Mt. Ventoux), results of early afforestation measures, the difficulties of utilizing the timber, and silvicultural treatment. [Cf. preceding abstract.]

360. HOFMANN, H. Impostazione della indagine ecologica nella coltura delle specie legnose a rapido accrescimento. **[Ecological research and the growing of fast-growing tree species.]** *Schweiz. Z. Forstw.* 111 (7), 1960 (348–61). [It.g.]

In making practical assessments of the suitability of a site for a given exotic, three different approaches appear to be necessary. For intensively cultivated plantation (e.g. Poplars) only climatic limits need be considered, since other requirements, e.g. water, nutrients, can be met by agricultural techniques. For growing exotics in pure stands under ordinary forest conditions, an analysis of ecological factors will generally require supplementation by trial plantings and a consideration of the effect of the species on the site; and for growing exotics in mixture, a plant-sociological approach will best take account of the complex factors involved. The three approaches are exemplified for *Pinus strobus* in Italy.

361. RADULOVIĆ, S., and VRCELJ, D. Resultati proučavanja razvoja vajmutskog bora na Deliblatskoj Peščari. **[The results of studies on the development of *Pinus strobus* on the Deliblato Sands.]** *Šumarstvo* 12 (11/12), 1959 (561–9). 9 refs. [Serb.f.]

Measurements in 1959 of a *P. strobus* stand planted in 1910 and now containing 185 trees, showed a diameter range of 2–27 cm. (mean 12·8) and a height range of 3–17 m. (mean 9·8). The stand grew at first in unfavourable conditions, in the shade of older *P. sylvestris*, but its increment in the period 1955–59 suggests that *P. strobus* could give good results in Serbia.

362. TRACI, C. Cultura unor specii lemnoase exotice per terenurile degradate din Valea Arieşului. **[The growth of some exotic tree species on degraded soils in the Aries Valley.]** *Rev. Pădurilor* 75 (5), 1960 (292–4). 2 refs. [Rum.]

Notes on increment of 25-year stands of *Quercus borealis*, *Pseudotsuga taxifolia*, *Pinus banksiana*, *P. strobus* and *Juniperus virginiana* on sites of varying soils, slopes and altitudes. All, except *P. banksiana*, have done fairly well at 600–700 m. alt., and *J. virginiana* merits large-scale planting on eroded soils. [Cf. *F.A.* 22 No. 491.]

363. FURNICĂ, H., and ENESCU, V. Aspecte privind cultura laricelui japonez (*Larix leptolepis* Gord.) în raza Ocolului silvic Stalin. **[Growing *L. leptolepis* in the Stalin forest district.]** *Rev. Pădurilor* 75 (5), 1960 (269–72). 7 refs. [Rum.russ. g.f.e.]

A study was made of 3 stands aged 40–50 years at 815, 640, and 600 m. alt. It was clear that Japanese Larch makes rapid early growth with a maximum c.a.i. of 16·9 cu.m./ha. under site conditions favourable to Beech, in mixture with which it effects vigorous self-pruning.

364. OLIVEIRA, J. A. LINCE DE. Rôle des essences exotiques dans le reboisement des montagnes du nord du Portugal. **[The role of exotics in mountain afforestation in the north of Portugal.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/60/5-Db*, 1960. pp. 14. [F.] Limited distribution.

365. GOLFARI, L. Notas sobre el cultivo de pinos y de otras coníferas en la Argentina. **[Notes on the cultivation of Pines and other conifers in Argentina.]** *Repr.* from *Rev. argent. Agron.* 26 (3/4), 1959 (65–99). 37 refs. [Span.span.e.]

Describes 4 climatic regions, listing for each the conifers most suitable for acclimatization, and reports on experience to date in the cultivation of 23 different species (all exotic except for *Araucaria angustifolia*), mainly in the humid and subhumid regions.

366. GOY, F. **Introduction of Pines into Western Cameroon (*Foumban*—French Cameroon).** [*Document*] *2nd Session Inter-African Forestry Conference, Pointe Noire 1958*, 1958. pp. 3. Limited distribution.

Notes on plantations of *Pinus khasya*, *P. patula*, *P. humboldtiana* (*P. lumholtzii*?), *P. caribaea* and *P. leiophylla*.

367. MENSBRUGE, G. DE LA. **Note on the introduction of Bamboo (*Bambusa vulgaris*) in Ivory Coast.** [*Document*] *2nd Session Inter-African Forestry Conference, Pointe Noire 1958*, 1958. pp. 14. Limited distribution.

General history, ecological factors, methods of formation and tending, costs of formation, increment data, cutting cycles and yields.

368. **Progress report of national working teams: summary by the Secretariat.** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/60–4*, 1960. pp. 7. [E.] Limited distribution.

369. Rapport d'activité des équipes nationales: France. **[Progress report of national working teams: France.]** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/60-3b*, 1960. pp. 19. [F.] Limited distribution.

Includes tabulated data on species and provenances of Eucalypts being tried in France, increment measurements on trial plots, and establishment costs.

370. **First results of the introduction of new species of *Eucalyptus* in Italy.** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/*60-7*d*, 1960. pp. 10. [E.] Limited distribution.

The results of the first 5 years of experiments by the Centro di Sperimentazione Agricola e Forestale, Rome, are summarized. The Eucalypts were sown in the nursery, transplanted into pots, and planted out in various places in Central and S. Italy. Many species were lost in the exceptionally severe winter of 1956. Of the species tested, *E. bicostata*, *E. dalrympleana*, *E. rubida*, *E. bridgesiana*, and *E. viminalis* were worthy of note for their resistance to low temperatures and their rapid growth. Notable for their adaptability to anomalous soils were *E. leucoxylon*, *E. ovata*, *E. paniculata*, *E. blakelyi*, and *E. sideroxylon* on clay soils; *E. gomphocephala*, and *E. occidentalis* on calcareous soils; *E. leucoxylon* on saline soils; and *E. brockwayi*, *E. algeriensis*, *E. paniculata* and *E. triantha* on arid soils. The importance of provenance is stressed.

371. Rapport d' activité des équipes nationales: Italie. **[Progress report of national working teams: Italy.]** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/*60-3*f*, 1960. pp. 15. [F.] Limited distribution.

Includes an annexe on plantation costs, for 900 ha. of Eucalypts established in Sicily.

372. Informe de las actividades de la Comisión Nacional del Eucalipto: España. **[Progress report of the National Eucalypt Commission: Spain.]** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/*60-3*a*, 1960. pp. 10 + 2. [Span.] Limited distribution.

Includes some data on species trials, and a breakdown of establishment costs.

373. Góis, E. da S. Reis. Les régions les plus favorables à la culture du *E. globulus* et du *E. camaldulensis* au Portugal. **[The most favourable regions for growing *Eucalyptus globulus* and *E. rostrata* in Portugal.]** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/*60-3*g*.1, 1960. pp. 5. [F.] Limited distribution. [Cf. *F.A.* 22 No. 351.]

374. **Progress report of national working team: Yugoslavia.** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/* 60-3*d*, 1960. pp. 3. [E.] Limited distribution.

A brief account of experimental planting of Eucalypts at the Forest Research Institute at Split.

375. Rapport d'activité des équipes nationales: U.A.R. Région Syrienne. **[Progress report of national working teams: United Arab Republic (Syrian Region).]** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/*60-3*c*, 1960. pp. 6. [F.] Limited distribution.

Includes tabulated data on species of Eucalypt under trial, and the climatic zones suited to them.

376. Beard, J. S. **A search for cold-resistant species of Eucalypt in Australia, suitable for planting in the eastern Transvaal.** *J. S. Afr. For. Ass.* No. 32, 1958 (72–81). 5 refs. [E.e.afrik.]

Suitable areas were visited in Queensland, the New England and Monaro Tablelands of N.S.W., the Australian Alps, Victoria and Tasmania, and a number of species are listed, from both riverain and alpine conditions, considered worth testing in the Transvaal.

377. **Research: *Eucalyptus*.** *Extr.* from *Rep. For. Adm. W. Pakistan 1957/58*, 1960 (20–1).

At Pirawala (annual rainfall 7 in., max. shade temperature 120° F.) where *Dalbergia sissoo* had not done well, *E. melanophloia*, *E. erythronema* and *E. dundasii* have shown considerable promise. In northern regions, with rainfall 20–30 in., the follow- are doing well—*E. melliodora*, *E. sideroxylon*, *E. polyanthemos*, *E. astringens* and *E. falcata*.

378. Morel, M. J. ***Eucalyptus* plantations in the savanna of the Pointe Noire area [Middle Congo].** [*Document*] *2nd Session Inter-African Forestry Conference, Pointe Noire 1958*, 1958. pp. 14. Limited distribution.

Gives an account of plantation techniques and results for some 15 species, and some estimates of costs.

379. Donis, P. **Comparative tests of *Eucalyptus* in Ruanda.** [*Document*] *2nd Session Inter-African Forestry Conference, Pointe Noire 1958*, 1958. pp. 4. Limited distribution.

Tabulated data on growth of 16 species from experimental plots in different parts of the country.

380. Reynders, M. **Notes on *Eucalyptus* plantations in Ruanda-Urundi.** [*Document*] *2nd Session Inter-African Forestry Conference, Pointe Noire 1958*, 1958. pp. 5. Limited distribution.

Includes progress of afforestation to 1955, a list of 14 species successfully introduced and 16 under comparative trials, and data on increment of *E. saligna* and *E. maidenii* subjected to different intensities of thinning.

381. Donis, P. **Report on tree-planting in Ruanda.** [*Document*] *2nd Session Inter-African Forestry Conference, Pointe Noire 1958*, 1958. pp. 8. Limited distribution.

Notes under standard headings for *Eucalyptus botryoides*, *E. saligna*, *E. maidenii*, *E. microcorys*, *Grevillea robusta*, *Jacaranda mimosaefolia*, *Pinus radiata*, *Acacia decurrens*, *Cupressus lusitanica*, and *C. benthamii*.

382. Pierlot, R. **Report on exotic afforestation species grown in the Belgian Congo and Ruanda Urundi.** [*Document*] *2nd Session Inter-African Forestry Conference, Pointe Noire 1958*, 1958. pp. 51. Limited distribution.

Notes on *Agathis loranthifolia*, *Araucaria* spp., *Callitris* spp., *Cupressus* spp., *Juniperus* spp., *Pinus*

spp., *Acacia* spp., *Albizzia moluccana*, *Anacardium occidentale*, *Cecropia leucocoma*, *Aucoumea klaineana*, *Casuarina* spp., *Cassia* spp., *Cedrela* spp., *Eucalyptus* spp., *Grevillea robusta*, *Hovenia dulcis*, *Jacaranda mimosaefolia*, *Melaleuca* spp., *Ochroma lagopus*, *Prunus salasii*, *Quercus suber*, *Syncarpia laurifolia*, *Tristania conferta*, *Tectona grandis*, and *Terminalia catappa*.

383. NUNES, F. PEREIRA. **Data for a study on the behaviour of exotic species in Mozambique.** [*Document*] *2nd Session Inter-African Forestry Conference, Pointe Noire 1958*, 1958. pp. 10. Limited distribution.

Notes on the behaviour of a number of *Eucalyptus* spp., *Cupressus lusitanica*, *C. goveniana*, *C. macrocarpa* and *C. sempervirens*, *Juniperus bermudiana*, *J. sinensis*, and *J. virginiana*, *Syncarpia laurifolia*, and *Callitris calcarata*.

384. MENSBRUGE, G. DE LA. **The introduction of *Tectona grandis* in the Ivory Coast.** [*Document*] *2nd Session Inter-African Forestry Conference, Pointe Noire 1958*, 1958. pp. 12. Limited distribution.

General history, and notes on climate, natural regeneration, enemies, height, diam. and volume increment, methods of treatment; site factors, methods of formation, and their cost. [Cf. *F.A.* 21 No. 340.]

385. MOORE, G. El cultivo del *Ulmus pumila* ofrece buenas perspectivas en la Argentina. [***U. pumila* shows promise for Argentina.**] *Rev. for. argent.* 4 (3), 1960 (77–81). [Span.]

Some general information is given on this species, considered suitable for the dry regions of western Buenos Aires province. One-year-old seedlings may be planted with exposed roots from June to the end of August on sand dunes already partly fixed by a previous sowing with grass. Firm planting is necessary, and if a spacing of 2·1 × 2·1 m. is used the canopy will be closed by the third year. Growth data from a 7-year-old stand in Luján, Buenos Aires province show a m.a.i. of 1·85 cm. in diam., 1·78 m. in height and 28·2 cu./m.ha. in volume. *U. pumila* therefore has excellent initial growth, comparable with that of some Eucalypts and, in some cases, greater than that of Poplars.

232.12. Races and Provenance Trials

See also Nos. 144, 147–8, 239, 270, 354.

386. GATHY, P. Contribution à l'étude des races du mélèze d'Europe (*Larix decidua* Mill.). [**The races of *L. decidua*.**] *Trav. Sta. Rech. Groenendaal* (*Sér. B*) No. 22, 1959. pp. 20. 16 refs. [F.f.e.]

With a view to discovering possible characteristics of different races, a study was made of the anatomy and the numbers and distribution of the stomata of needles of *L. decidua* from 11 different provenances. It was not found possible to distinguish any effect of provenance on the number of rows of stomata, which was apparently determined by the general climate of the growing season and position in the crown. Of the anatomical characters examined, only the transfusion tissue appeared to be significant: it was more abundant in Larch of Alpine than of Sudeten origin.

387. FRUND, C. L'acclimatation des mélèzes de différentes provenances dans les forêts de l'École forestière. [**Climatic adaptation of different Larch provenances in the forests of the School of Forestry [Zurich].**] *Schweiz. Z. Forstw.* 111 (8), 1960 (409–20). 4 refs. [F.g.]

Presents data on height and diameter development, and assessments of the quality of individual trees and stands based on ca. 3000 trees, aged 3–16 years, of 53 provenances (largely Alpine or Sudeten) from altitudes of 40 to > 2000 m., planted on 16 sites in the Uetliberg at 600 to 840 m. alt. In general, the cultivation of Larch in this area appeared justified. Results were best in the drier variants of the *Querceto-Carpinetum*, particularly on S. and W. exposures, and on well aerated, light, fresh soils. In general, lowland provenances, particularly some Sudeten, did better than high-altitude ones. The altitude of the planting site did affect the growth of individual races, but though, in general, height and diameter growth decreased with increasing difference between the altitudes of origin and of plantation site, similar altitude was not a guarantee of success. Several Alpine ecotypes could be distinguished.

388. GATHY, P. L'expérience internationale sur l'origine des graines d'épicéa (*Picea abies* Karst.). Résultats en Belgique. [**International *P. abies* provenance trial. Results in Belgium.**] *Trav. Sta. Rech. Groenendaal* (*Sér. B*) No. 24, 1960. pp. 32. 17 refs. [F.f.e.]

[Cf. *F.A.* 18 No. 3931.] Results indicate that Scandinavian provenances and those from high altitudes are the first to flush, and that there is a strong negative correlation between increment and early flushing. Best increment was obtained from Polish and Balkan provenances. The author propounds a theory that both date of flushing and early growth rate are correlated with latitude of provenances, and discusses possible reasons for the superiority of Polish provenances of a number of other species (*Pinus sylvestris*, *Populus tremula*, *Carpinus betulus*, and *Larix decidua*). The natural distribution of the species is also discussed, with particular reference to its supposed discontinuity. The author comes down in favour of a single continuous natural area of distribution, apparent interruptions being due to human intervention.

389. SARVAS, R. Metsänviljelyksessä käytetyn siemenen kotipaikan etäisyys viljelypaikasta. [**The distance of the source of seed used in forest plantations from the plantation site.**] *Metsät. Aikak.* 1960 (6/7), (217–20). [Fi.e.]

Analyses results of experiments with Spruce and Pine by O. Heikinheimo 30–50 years earlier, concluding that there is no great scope for the transfer of seed southwards or northwards; transfers of 200–300 km. are the maximum possible if yield is not to be reduced. *From author's summary.*

232.13. Trials of Hybrids and Other Products of Tree Breeding

See section 165.3/.7.

232.2. Preparatory Work. Auxiliary Measures

See also Nos. 255, 349, 466–9, 480, 918.

390. LAL, K. B. M. **Eradication of *Lantana*, *Eupatorium* and other pests.** *Indian For.* 86 (8), 1960 (482–4).

Describes a method of preparing small seedbeds by piling weed brush on them and allowing it to burn slowly under cover of sods, which has been adapted from practice in the Khasi-Jaintia hills for growing Pine and Wattle on the *taungya* system, and both disposes of the weeds and enriches the soil. Composting of herbaceous weeds is also advised and a method suggested.

391. SOWERS, D. W. **The use of chemicals in forest site preparation.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (460–5). O.W.

Summarizes the work of the W. Virginia Paper Co. in freeing sites of hardwoods, in preparation for Pine planting, by aerial spraying, root collar treatment, high-volume spraying, mist blower and a combination of chemical and mechanical treatment.

392. ERUSALIMSKIJ, V. I. Opyt sozdanija kul'tur sosny na neraskorčevannyh vyrubkah v Vetlužsko-Unženskom leshoze. [**Scots Pine planting trial on fellings in the Vetluzhsko-Unzha leskhoz, where no stump grubbing had been done.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (47–79). [Russ.]

Tabulates data on numbers of seedlings from direct sowing, and transplant survival and performance, on areas prepared by root-grubbers, ploughs, and hand tools, together with costs of ground preparation. It appears that broadcast sowing on patches scarified by a root-grubber is the most economical method under the conditions of this district (taiga zone).

393. MONJAUZE, A. **Afforestation with the aid of heavy soilworking implements.** *Indian For.* 86 (7), 1960 (388–94).

Summarizes early experimentation and current techniques used in Algeria and the benefits derived from them [cf. *F.A.* 21 No. 3002].

394. SETH, S. K. ***Méthode steppique.*** *Indian For.* 86 (7), 1960 (385–7 + 2 pp. of photos).

Brief notes on the use of the '*méthode steppique*' in Israel and its possible application in India, intended as a supplement to the article by Monjauze [see preceding abstract].

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

232.311. Seed Production (Seed-Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 262, 265, 460–1, 510.

395. TOMPA, K. Egy Soproni vörösfenyves 1956. Évi magtermése és az állomány kezelése. [**The seed crop of a Larch stand at Sopron in 1956, and its utilization.**] *Erdészettud. Közl., Sopron* 1959 (1), (3–33). 14 refs. [Hu.hu.russ.g.e.]

A detailed study was made of an average crop in a Larch stand of unknown provenance, on a class-I site, aged 78–98. More than ⅔ of the crop was borne on the middle part of the crown. Cones on the lower part of the crown were larger; the south side of the crown also had larger as well as more cones, and more full seed. Full-seed content of cones varied greatly—in 3 trees tested it varied from 18·6 to 72·2%, and since the weight of full and empty seed is much the same, mechanical separation is not possible.

396. JEFTIĆ, J. Neka zapažanja o urodu semena Pančićeve omorike na Tari. [**The seed yield of *Picea omorika* at Tara.**] *Šumarstvo* 13 (1/2), 1960 (79–87). 5 refs. [Serb.f.]

In its natural stations, *P. omorika* has a good seed-crop every 3–4 years. If, as sometimes, the period is shorter, yield is also reduced. Harvesting of cones, carried out 10–20 October, is a physically hazardous operation, requiring young, brave and practised workers. The trees are slender and grow on mountainous terrain above the gorge of the river Dina. The cones are resinous, difficult to detach, and grow in greatest concentration in the top 1·5 m. of the tree. Measurements of cones from 3 differing sites, (*a*) Crvene Stene, (*b*) Zmajevski Potok, (*c*) Crveni Potok, are presented. The greatest number of cones was collected from (*a*) (a mean of 512 cones or 3 kg. per tree) and the least from (*b*) (123 cones or 0·7 kg.). The proportion of large cones (> 5 cm. long) in the total was 22% by number and 30% by weight for (*a*), 10% and 14% for (*b*) and no large cones for (*c*). The number per kg. of small and large cones respectively was (*a*) 195 and 127, (*b*) 187 and 134, (*c*) 272 and 0. The largest and heaviest cones with most seed and highest germination % were found at (*a*); it is considered that natural regeneration is assured here, but not at (*b*) or (*c*). [Cf. *F.A.* 13 No. 1136.]

397. THORBJORNSEN, E. **A cone production study in Loblolly Pine on the coastal plain of North Carolina.** *J. For.* 58 (7), 1960 (543–7). 11 refs.

A total of 71 trees were climbed and studied in 1957, and 60 in 1958. The association between d.b.h. or stem volume and cone production was significant at the 0·1% level, and ca. one-third of total variation in cone production was accounted for by either of these two variables. Total tree height accounted for only 13% of the variation. The sample correlation coefficient between branch volume and cone production was significant at the 0·1% level, but this relationship may not be strictly linear, the yield of cones becoming constant rather abruptly at a branch volume of ca. 4 cu. ft. Length of live crowns accounted for only 13% of variation and crown-length/tree-length ratio has no predictive value. The proportion of buds producing ♀ flower primordia, rather than total number of buds, determines the fecundity of a tree. There was no difference in cone production between trees growing on average and good sites. The presence or

absence of old cones gives a good estimate of future cone crops; > 41% of total variation can be accounted for by this observation.

398. BABOS, I. Magtermelö akácosok és nyárfások vizsgálata. **[Seed-producing stands of Robinia and Poplars.]** *Erdész. Kutatás., Budapest* 6 (3), 1959 (1960), (15–65). 22 refs. [Hu.russ.g.e.*russ.g.e.*]

In view of the importance as seed-sources of stands of fast-growing trees (particularly *Robinia pseudoacacia, Populus alba, P. nigra, P. tremula* and *P. canescens*) in Hungary, the Director General of Forests has ordered the selection, surveying, and registration of all suitable stands and groups of these species for seed production. In the course of this work, the author also investigated site conditions. It is emphasized that, in selecting seed-sources, regard should be had to aptitude for particular sites. Thus, in all regions where it is intended to maintain or increase the area under Robinia, the best stands on characteristic sites should be reserved for seed production, even though their growth places them in quality class III only. In the same way, groups or even single trees growing on unfavourable sites should be registered, on the chance of selecting a local variety with high drought resistance. Incidental observations were made on the so-called 'kovárvány' effect (buried humus-rich layers occurring in sands); indicator species on Robinia sites; the importance of ground-flora litter in maintaining fertility in Robinia stands; and classification of Robinia sites.

399. KOPECKY, F. A magtermelö állományok genetikai kérdései. **[The genetic problems of seed orchards.]** *Erdész. Kutatás., Budapest* 6 (3), 1959 (1960), (3–14). 13 refs. [Hu.russ.g.e.*russ.g.e.*]

Proposes that the seed needed for afforestation in Hungary should be obtained from special seed-producing stands established by grafting scions from selected plus trees. The selection, registration, and propagation by grafting of these trees in all botanical regions of the country is an urgent task. Photographs are given of three such registered 'mother trees'—two Aspens and one Robinia.

400. ANDERSSON, E. Fröplantager i skogsbrukets tjänst. **[Seed orchards in forestry.]** *K. Skogs- o. LantbrAkad. Tidskr., Stockh.* 99 (1/2), 1960 (65–87). [Sw.e.]

An account of existing and proposed seed orchards, seed requirements, and research on provenances, breeding, etc., in Sweden.

401. HEITMÜLLER, H.-H., and MELCHIOR, G. H. Über die blühfordernde Wirkung des Wurzelschnitts, des Zweigkrümmens und der Strangulation an japanischer Lärche (*Larix leptolepis* [Sieb. et Zucc.] Gord.). **[The flower-inducing effects of root pruning, branch bending and strangulation on Japanese Larch.]** *Silvae Genet.* 9 (3), 1960 (65–72). 57 refs. [G.g.e.f.]

Four-year-old *L. leptolepis* grafts were subjected in June 1956 to: (1) root pruning, (2) strangulation with a thin aluminium band, or (3) bending of the leader to ground level. Counts were made of flowers from the middle to the end of March 1958. Although total number of flowers and number of ♂ flowers were increased by all treatments, only (2) gave a significant increase compared with controls, accompanied by a significant increase in ♀ flowers, whereas (1) and (3) reduced the number of ♀ flowers.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also Nos. 396, 412–5, 423, 600.

402. SKILLING, D. D. **Tractor-mounted ladder for tree-crown studies and seed collection.** *For. Equipm. Note, FAO* No. *A*.20. 60, 1960. pp. 2.

A 45-ft. magnesium [alloy?] extension ladder (weight 66 lb.) fastened to a special framework on a crawler tractor.

403. ALLEN, R. M. **Pole steps for climbing trees.** *J. For.* 58 (7), 1960 (563).

Describes a successful experiment in the use of screwed-in telephone pole steps to assist in the climbing of moderate-sized Slash and Loblolly Pines (9–11 in. d.b.h.). After 3 years the steps were unscrewed 3–6 turns, depending on growth on the tree. No resin was exuded, and barkbeetle attack was prevented by spraying with BHC at the time of installation. This device might be useful on trees that have to be climbed repeatedly.

404. VLASE, I., and STEGARU, M. Uscător electric pentru extragerea semințelor din conurile de rășinoase. **[An electric kiln for extracting seed from cones.]** *Rev. Pădurilor* 75 (2), 1960 (67–71). 3 refs. [Rum.russ.g.f.e.]

Describes, with photographs and diagram, a kiln designed by the authors, with schedules of temperatures, r.h. inside and outside the kiln, duration of pre-drying and of kiln drying, and time taken to empty the kiln.

405. VARGA, D. D. Uscătoria de conuri 'Mihai Viteazul' din Ocolul silvic Turda. **[The Mihai Viteazul cone-drying plant in the Turda forest district.]** *Rev. Pădurilor* 75 (6), 1960 (329–32). [Rum.]

A detailed description, with photographs, of the storage facilities, conveyor system etc., as well as the actual kiln, and the process of operation.

232.315. Seed Storage and Treatment

See also Nos. 423, 709, 795, 1077.

406. PERRAU, A., GUDIN, C., and RIDÉ, M. La conservation des châtaignes de semence. **[The preservation of seed Chestnuts.]** *C.R. Acad. Agric. France* 46 (9), 1960 (549–56). [F.]

The following treatments used to preserve eating chestnuts were applied to seed chestnuts: (1) soaking for ¼ hr. in methoxyethylmercuric chloride, (2) coating with thiram, (3) soaking for ¼ hr. in $CuSO_4$, (4) 8 days' soaking in water, and (5) 8 days' soaking in water with sorbic acid (1·6 g./litre). After treatment all seeds were stratified in sand without previous drying. The results of (1), (2) and (3) were not satisfactory, but (4) and (5 gave highly satisfactory results. Storage in the open is recommended in preference to storage in a cellar, so long as frost injury can be avoided.

407. LØKEN, A. Frø og frøbehandling. **[Seed and seed treatment.]** *Extr.* from *Årsskr. Norske Skogplantesk. 1959*, 1960 (31–41). 10 refs. [Nor. nor.]

Reviews methods of improving germination of Silver Fir, *Larix* spp., Norway and Sitka Spruce, *Pinus* spp. and Douglas Fir.

408. KOZLOWSKI, T. T. **Effect of kinetin and gibberellic acid on germination of White Spruce seed.** *For. Res. Note Wis. Coll. Agric.* No. 57, 1960. pp. 3. 2 refs.

Replicated lots of 100 *Picea glauca* seeds were soaked for 24 hours in kinetin (6-furfurylaminopurine) at 5, 15, and 30 p.p.m. and in gibberellic acid at 50, 100, and 200 p.p.m., and germinated under uniform laboratory conditions. Kinetin reduced not only the speed of germination, but also the total number of seeds germinated 30 days after sowing. The highest dosage caused greatest inhibition. Gibberellic acid promoted somewhat earlier germination than in controls, but had no evident stimulating effect on total germination. At its highest concentration it depressed total germination. [Cf. *F.A.* 20 No. 4146.]

409. VINCENT, G. Předosevní příprava semen lipových a habrových. **[Pre-treatment of seeds of *Tilia* spp. and *Carpinus betulus*.]** *Prace Výzkum. Úst. Lesn. ČSR* No. 17, 1959 (103–33). 34 refs. [Cz.cz.russ.g.]

Describes extensive experiments on the removal of the pericarp and maceration of the testa of *T. cordata* and *T. platyphyllos* seeds, and the stratification of these species and *C. betulus*. The best treatment for all three species was stratification for 150–180 days (first warm, then cold) in coarse, moist sand.

410. CAVAZZA, L., and BENEDICTIS, G. DE. Impermeabilizzazione dei tegumenti seminali ottenuta con trattamento in acqua calda. **[Impermeability of seed-coats induced by warm-water treatment.]** *Nuovo G. bot. ital.* 66 (1/2), 1959 (151–60). 20 refs. [It.it.e.] A.P.B.

Immersion in water at 50–65° C. increased the % of hard seed in 12-year-old seed of *Gleditsia triacanthos*. At temperatures of 70 to 85°, a short immersion (< ½ min.) increased it, while longer immersion reduced it. It is suggested that the flow of heat, before the water reaches the impervious layer of the seed-coat, induces hardness, and that the slower process of colloidal absorption of water, assisted by heat, reduces it. [Cf. *F.A.* 13 No. 2923.]

232.318. Seed Testing. Germination Tests. Seed Quality

See also Nos. 263–4.

411. BJØRNSETH, I.-P. Om granfrøets spirehastighet og dens bruk som uttrykk for frøkvalitet. **[The germinative energy of Spruce seeds and its use as an expression of seed quality.]** *Extr.* from *Årsskr. Norske Skogplantesk. 1959*, 1960 (97–107). 8 refs. [Nor.]

Discusses both original experiments and those from the literature, concluding that germinative energy can be used as an expression of seed quality if the same external conditions are always used during the analysis (especially temperature and light). Seed weight is a useful supplementary indication of quality.

412. POPESCU, I. Particularităţile morfo-biometrice şi indicii calitativi ai conurilor şi seminţelor de *Picea alba* Ait. **[Morpho-biometrical peculiarities and quality indices of the cones and seeds of *P. glauca*.]** *Rev. Pădurilor* 75 (5), 1960 (261–3). [Rum.russ.g.f.e.]

Measurements were made on samples from 15-year-old trees from a research station near Bucharest, and germination tests carried out later. Cone length was 2–6·5 cm., and diam. 0·8–2 cm.; seed length 4–1·4 mm., width 2–1 mm., and thickness 0·5–1·4 mm. The % full seed averaged 56 by weight and 47·8 by number; 1000-seed weight was 1·15–4·39 g. Seed from the largest cones had the highest germinative capacity (52·75%).

413. ČABRAIĆ, T. Analiza šišarica i sjemena jele (*Abies alba* Mill.) i smrče (*Picea excelsa* Lk.) sa područja Igmana kod Sarajeva. **[Analysis of cones and seeds of *A. alba* and *P. abies* from the Igman district near Sarajevo.]** *Šumarstvo* 13 (3/4), 1960 (233–4). 1 ref. [Croat.]

Details of dimensions, weight, yield, fertility and seed characteristics.

414. FLORESCU, I., BALĂN, I., and CARABELA, Ş. Contribuţii la studiul fructificaţiei laricelui (*Larix decidua* Mill.) din masivul Bucegi. **[The fruiting of *L. decidua* in the Bucegi massif.]** *Rev. Pădurilor* 75 (5), 1960 (264–8). 12 refs. [Rum.]

Measurements were made on 2000 cones; mean length was 25 ± 0·09 mm., and mean weight 1·96 g. The 1000-seed weight, number of full seeds, and germination capacity all increased with increasing cone length.

415. SIMAK, M. **Influence of cone size on the seed produced (*Pinus silvestris* L.).** *Medd. SkogsforsknInst., Stockh.* 49 (4), 1960. pp. 16. 4 refs. [E.e.sw.*sw*.g.]

An analysis, based on 70 cones from each of 2 trees [cf. *F.A.* 15 No. 2435] for the years 1952/55–1955/56, confirming earlier findings. In addition, the frequency of empty seeds was found to decrease with increasing cone weight. The relationships between seed properties and cone weight appear to be determined by the genotype, but are much modified by climate and vary with the seed-year.

416. BERGMAN, F. Något om frömognad och fröbeskaffenhet hos tallen i Norrland. **[Seed ripening and seed quality of Pine in Norrland.]** *FS Inform. Fören. Skogsträdförädl., Uppsala* No. 9, 1960. pp. 2. 8 refs. [Sw.]

Mean germination % of seed from alt. 300–400 m. and lat. 64°–65° for the years 1950–59 was so closely related to growth units [cf. *F.A.* 19 No. 314] computed by reference to temperatures at 1 p.m. from June to Sept. at Stensele, that the use of growth units is suggested as a first guide in forecasting seed quality.

417. JOVANOVIĆ, B., and TUCOVIĆ, A. Zapažanja o dejstvu jonizujućeg zračenja na seme i prirast *Populus virginiana* Foug. Prethodno saopštenje. **[The effect of ionizing radiation on seeds and [seedling] growth of *P. deltoides* [× *P. serotina*]. Preliminary report.]** *Šumarstvo* 12 (9/10), 1959 (451–62). 7 refs. [Serb.f.*f.*]

Samples of 1000 seeds from a natural crossing between *P. deltoides* and *P.* × *serotina* were exposed to γ rays from a Co^{60} source in late May 1958. With their cotton removed, they received doses of 500–50,000 r units. No significant difference was noted in germination % with difference in dose. After 40 days, treatments up to 10,000 r showed a certain stimulating effect compared with controls, while stronger doses tended to reduce seedling growth. After 2 months, it was noted that treatment with 500 and 1000 r caused most increase, while doses > 10,000 r reduced growth above ground. At the end of the growing season, the stimulating effect was seen chiefly with the 500 and 1000 r treatments, the latter causing greatest increase in growth. Doses above 5000 r increasingly reduced growth both of parts above ground and of root systems. The survivors are being grown on for further study. [Cf. *F.A.* 20 Nos. 3075–6; 21 No. 398.]

232.32. Plant Rearing. Nursery Practice

See also Nos. 474, 513, 924.

418. [COLE, W.] **Tree production, from seedlings to specimens.** *Amer. Nurserym.* 112 (4), 1960 (15–6, 89–96).

Summarizes a paper, based on practical experience, given at the eighth annual Connecticut nurserymen's short course, and covering the complete cycle of tree production from propagation to preparation of trees for the market.

419. DOEGE, T. C. **An infectious disease of nurserymen.** *Tree Plant. Notes* No. 41, 1960 (1–2).

An account of a sporotrichosis, caused by *Sporotrichum schenckii*, which has occurred in a number of workers in forest tree nurseries in the Middle West of the U.S.A. Iodides given by mouth specifically cure this infection.

420. KĘDZIERSKI, Z. Próba ustalenia metody oceny produkcyjności sosnowych szkółek leśnych. **[Method of assessing the productivity of Scots Pine nurseries.]** *Prace Inst. Bad. Leśn.* No. 196, 1960 (31–72). 16 refs. [Pol.russ.e.]

The productivity index [see *F.A.* 16 No. 1649] here suggested is $R = K \times 100/I$, where K is the number of seedlings of desired quality raised per are, and I is the number of seeds sown per are. The criterion of quality of 1-year seedlings was shoot length > 5 cm., i.e. strong seedlings [see *F.A.* 15 No. 3525]. Sampling techniques are discussed. Using data from 30 nurseries, productivity is classed as poor with $R < 40$, fair with $R = 40$–56, and good with $R > 56$.

421. KĘDZIERSKI, Z. Próba ustalenia sposobu określania zapasu siewek sosnowych w szkółkach. **[Method of determining the stocks of Scots Pine seedlings in nurseries.]** *Prace Inst. Bad. Leśn.* No. 197, 1960 (73–88). 6 refs. [Pol.russ.e.]

Describes a sampling method evolved for nursery inventories.

422. ROTARU, C., and RUBȚOV, Ș. Contribuții la cultura în pepiniere a bradului duglas (*Pseudotsuga taxifolia* Britt.). **[Raising Douglas Fir in the nursery.]** *Rev. Pădurilor* 75 (1), 1960 (25–8). [Rum.russ.g.f.e.]

Notes on experiments at a number of Rumanian forest nurseries, using seed imported from Austria in 1957. Germination, survival, and first-year growth were satisfactory in the Beech zone (lower slopes of mountains) and recommendations for nursery practice are made.

423. HADFIELD, W. **The raising of Bamboo from seed.** *Two and a Bud, Cinnamara P.O., Assam* 5 (2), 1958 (9–10). From *abstr.* in *Hort. Abstr.* 29 (1), 1959 (No. 676).

As they are likely to be damaged by rodents, insects and fungi, Bamboo seeds should be collected by shaking on to sheets, and not from the ground. They are treated with insecticides and dried before sowing in shaded nurseries in drills 12 in. apart and 4–6 in. apart in the drill. Germination takes 2–6 weeks, and the seedlings may be transplanted to the field 12–18 months after sowing. The large seeds of *Melocanna bambusoides* should be spaced at 12–15 in.

232.321. Nursery Sites, including Factors affecting Selection of Sites for Nurseries

424. PAPP, L. A körölárnyalt csemetekert mikroklimatikus viszonyai. **[Microclimatic conditions in a nursery surrounded by shade.]** *Erdész. Kutatás., Budapest* 6 (3), 1959 (1960), (111–38). 8 refs. [Hu.hu.russ.g.e.*russ.g.e.*]

In many districts of Hungary small nurseries have been established in openings in old stands (especially of Scots Pine), in the belief that the microclimate of the surrounding forest will be beneficial to the seedlings. The author investigated several such nurseries, making repeated microclimatic measurements during the summer of 1957. He concludes that nurseries located in an old stand will have a favourable microclimate only if adequately shaded by the surrounding trees. Microclimate varies even within a small nursery owing to different distribution of direct and reflected light and air stagnation. Morning sunshine gives a moderate, afternoon sunshine an extreme microclimate. The rapid and severe changes of temperature on the soil surface occurring in the daily course of shade are very disadvantageous, and reflected light in the afternoon should also be avoided.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 247, 445–6, 711, 1075.

425. MORRIS, C. L. **Soil fumigation evaluations in White Pine [*Pinus strobus*] seedbeds and other nursery investigations [in Virginia].** *Tree Plant. Notes* No. 41, 1960 (17–21).

Dow Trizone proved to be the outstanding soil fumigant evaluated at the west section of the New

Kent nursery in 1959. The importance of fumigation in 'new' soil was emphasized by the survival figures. Heat injury is presumed to be the main cause of annual White Pine seedling loss in late June to early July at this nursery. Soil surface temperatures were found to have reached 138° F. at least once between June 15 and July 2. MeBr released under plastic seedbed covers at the rate of ¾ lb./100 sq. ft. by immersing the pressurized cans in a hot-water bath produced excellent seedling stands of White Pine at the Charlottesville nursery. Formaldehyde as a soil drench was about equally effective, but the high cost of this material must be taken into consideration. Vapam was relatively ineffective. These tests show the importance of finding the most suitable material for the particular soil in question. *From author's summary.*

426. SAKSENA, S. B. **Effect of carbon disulphide fumigation on *Trichoderma viride* and other soil fungi.** *Trans. Brit. Mycol. Soc.* 43 (1), 1960 (111–6). 7 refs. O.B.D.

[Cf. *F.A.* 17 No. 2717.] A study was made of the effects of fumigation with CS_2, over the range 0·05–20 ml. CS_2/250 g. soil, on the soil fungus flora. *T. viride* became dominant after fumigation at 0·05–0·1 ml./ 250 g. soil. The tolerance of *T. viride* to CS_2 was lower than that of *Penicillium nigricans* and *P. citrinum*, and much lower than that of the most resistant fungi, viz. *Aspergillus fumigatus*, *A. fischeri*, *P. luteum* and several unidentified species. The frequency with which *T. viride* has been reported as a re-colonizer of fumigated soils is attributed as much to its high growth rate as to its tolerance of CS_2. *From author's summary.*

427. **An annual review of world production, consumption and trade of fertilizers, 1959.** FAO, Rome. 1959. pp. 140. 58 tbls.

Covers a period of six years—1953/4–1958/59.

428. MOORE, O. W. **Ammonium nitrate fertilizer can explode.** *Tree Plant. Notes* No. 41, 1960 (3–4).

Discusses the hazards attendant upon the storage of quantities of this commonly used fertilizer.

429. SHIBAMOTO, T., and NAKAZAWA, H. **[The absorption of inorganic nutrients in growing seedlings of Akamatu (*Pinus densiflora* Sieb. et Zucc.).]** *J. Jap. For. Soc.* 40 (9), 1958 (383–90). 4 refs. [Jap.jap.e.]

Tabulates, as % dry weight of the *P. densiflora* seedlings examined: contents of ash, K_2O, CaO, MgO, P_2O_5, and N. The periods of increase or decrease in these constituents and the reaction of seedlings in fertilized as well as unfertilized plots, are recorded in graphs.

430. KRAUSE, H. H. **Loss and uptake of nutrients in coarse textured irrigated forest nursery soils.** *Abstr. of thesis*, in *Dissert. Abstr.* 20 (11), 1960 (4234–5). O.R.S.

N, P, K and Ca were applied, as readily or slowly available fertilizers before sowing, as fertilizer solutions for treating growing plants, and in combination with leguminous or non-leguminous green-manure crops. *Pinus resinosa* was used as the test plant. Leaching losses and uptake of nutrients were determined by periodic analysis of soils, plant tissues, and leachates collected from Alundum tension lysimeters. When nutrients were applied before sowing as $(NH_4)_2SO_4$, KCl, and Ca monophosphate, 70–90% of the N, 17% of the K and a large fraction of the exchangeable Ca and Mg were leached from the root zone during the first growing season; P remained nearly immobile. The loss of nutrients was considerably reduced by using slowly available fertilizers including urea-formaldehyde, K metaphosphate, and 20-mesh syenitic granite. The mean net loss of N from urea-formaldehyde was 35%. The maximum net loss of K was 6%. With application of fertilizer solutions, mean net loss of N was 10–20% and leaching of Ca and Mg was practically arrested. However, in treatments of 1 + 0 stock, as much as 20% of the K was lost by leaching. Bentonite increased the retention capacity of the soil and reduced the loss of N and bases. The catch crop of oats proved efficient in preserving all major nutrients. Soybeans arrested leaching while growing, but when they were incorporated into the soil, and decomposed, a large fraction of N and K was lost into the drainage water. The uptake of nutrients and the rate of dry-matter production were closely correlated with the stability of the nutrients in the soil. An average stand of Pine seedlings extracted from the soil 222 lb. N, 36 lb. P, 92 lb. K, 63 lb. Ca and 30 lb. Mg per acre. Six to nine % of these amounts were used by the plants in the first, 15–41% in the second and 53–80% in the third growing season. The results indicate that a certain fraction of applied nutrients is rendered temporarily unavailable by chemical or biological fixation.

431. THEMLITZ, R. Eignung von Magnesiumkalken zur Mg-Versorgung von Fichten- und Kiefernsämlingen, ein Beitrag zum unterschiedlichen Verhalten beider Pflanzen hinsichtlich Nährstoffaufnahme und -verteilung. **[Suitability of magnesian limestones for supplying Mg to Spruce and Pine seedlings; differences in the behaviour of the two species as regards nutrient uptake and distribution.]** *Forst- u. Holzw.* 15 (12), 1960 (233–6). 6 refs. [G.g.]

Seedlings were grown in a Tertiary sand low in nutrients, with KPN fertilizers alone, and with KPN plus various kinds of magnesian limestone (m.l.) [cf. *F.A.* 20 No. 4453]. In the second growing season, yellow-brown needle discoloration occurred in both species given KNP only, but not in those plants also given m.l. The seedlings were harvested, measured and analysed after two growing seasons. Total dry weights were greater for Pine than for Spruce, and in both species were greater with m.l. than without it (in Spruce by up to 100%); the shoot/root ratio was 1 : 0·59 for Spruce, but 1 : 0·26 for Pine. Cases of Ca/Mg and Ca/K antagonism were clearly recognized, and also impairment by m.l. of Mn and Na uptake; Fe uptake was not affected. N and K were distributed mainly in the aerial organs, and P and Mg evenly throughout the plants. Ca was stored mainly in the aerial organs in Spruce, and in the roots in Pine. In natural acid soil the aerial parts were considerably richer in Mn than the roots,

but after liming this difference largely disappeared. It is thought that the distribution of absorbed ions is controlled selectively and specifically by the roots and that the roots store the ions of any element which the plant does not need, or does not need in the amount supplied.

432. SCHWENKE, H. J. Koniferenanzucht in einen neuartigen Saatbeet. **[Raising conifers in a new type of seedbed.]** *Forst- u. Holzw.* 15 (10), 1960 (193–5). 6 refs. [G.]

The bed, 1–1·2 m. wide and ca. 20 cm. deep, is dug out and filled in winter with 18 cm. of compost (Larch litter, Larch raw humus, and slightly loamy humous sand plus grass and some fertilizers). This is topped with a 5-cm. layer of a mixture of washed quartz sand (50% by vol.), rubbed peat (25%) and chopped sphagnum moss (25%) to form the actual seedbed. The management and advantages of such beds are discussed, and details given on the growth of 1- and 2-year-old seedlings of 9 coniferous species in the beds. The beds have proved good even with species usually difficult to raise, such as *Abies procera, A. grandis, Picea sitchensis* etc.

232.323. Sowing and Covering

433. WYCOFF, H. B. **Cottonwood seeding at the Mason State tree nursery.** *Tree Plant. Notes* No. 41, 1960 (13).

Describes a method of sowing *Populus deltoides*, by suspending catkins from slatted covers over the seedbeds. Burlap is placed over the covers to confine the cotton, and irrigation does not begin until enough seed has been dispersed over the bed.

434. JANSON, L. Wpływ głębokości wysiewu nasion sosny na odsetek wschodów i stopień porażenia siewek przez grzyby zgorzelowe. **[The effect of sowing depth of Scots Pine on the number of seedlings obtained and the degree of fungus infection.]** *Sylwan* 104 (3), 1960 (51–60). 1 ref. [Pol.russ.e.]

Seeds were sown in a greenhouse at depths of 0, 0·5, 1, 1·5, 2, 2·5 and 3 cm. Statistical analysis of results indicated that the optimum depth was 0·5–1 cm., and that depths should not exceed 1·5 cm. Fungus infection of seedlings tended to increase with increasing depth of sowing: 15% at 0·5 cm., 17% at 1 cm., 27% at 2 cm., and 79% at 3 cm.

435. GIORDANO, E. **Preliminary observations on hydroponic cultures of Eucalypts.** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/60-7b*, 1960. pp. 7. [E.] Limited distribution.

Experiments began in 1958 at the Centro de Sperimentazione Agricola e Forestale, Rome, and are still continuing, in order to determine the adaptability of different species of *Eucalyptus* to hydroponic culture, and to compare their growth with that of pot plants. The most promising of the species tested seemed to be *E. trabutii, E. leucoxylon, E. rostrata* and *E. botryoides*. *E. globulus* and *E. viminalis* survived neither in water nor in vermiculite. The technique of raising seedlings in this way is described in detail. The date of planting out seemed to have considerable effect on survival in the field, e.g. *E. trabutii* planted out in Oct. 1958 gave 76·31% establishment; in Feb. 1959, 22·61%; and in June 1959, 82%. [Cf. *F.A.* 20 No. 428.]

232.324. Transplanting and Lining Out, including Grading of Seedlings

See also Nos. 471–5.

436. ARNBORG, T., SKÄRBY, R., and KARLSSON, I. Plantavståndet vid omskolning. **[Spacing of plants in transplanting.]** *FS Inform. Fören. Skogsträdförädl., Uppsala* No. 6, 1960. pp. 1. [Sw.]

Trials with 2-year-old Spruce seedlings, transplanted at spacings within the row varying by 1-cm. steps from 3 to 7 cm., indicated that, whereas the height of 2 + 2 plants was about equal, root volume (measured by immersion in water) was linearly related to spacing.

232.325. Tending (in both Seedbeds and Transplant Beds)

See also No. 698.

437. KILBURY, R. R., KOZLOWSKI, T. T., and KUNTZ, J. E. **Leaching and movement of triazine herbicides.** *For. Res. Note Wis. Coll. Agric.* No. 55, 1960. pp. 3.

Greenhouse experiments were designed to study (1) the leachability and (2) the movement, of herbicides in Wisconsin forest nursery soils. In (1), simazine, atrazine, and neburon were sprayed in water suspensions at rates of 1 and 2 lb. active ingredient per acre on soils from 2 nurseries (a sand and a sandy loam) in paper cartons. Groups of 5 cartons were leached with 1, 2, 4, 8, or 16 surface inches of water. In each carton, 25 oat seeds were planted and the dry weight of seedlings was determined after 3 weeks. It was found that simazine and atrazine depressed top growth at both dosages, with greatest reduction at 2 lb./acre. Some reduction occurred even in soils leached with 16 in. of water. Leaching, though not great in either soil, appeared more rapid in the sand. Neburon had little if any effect on seedling growth. In (2), cartons of soil were sprayed at 1 lb./acre with simazine, atrazine, Geigy 30026 and neburon, and leached with 2 in. of water. After 16 hours the cartons were sliced into horizontal sections 1 in. thick and 25 oat seedlings planted in the 1st, 3rd, and 8th sections from the top. After 4 weeks, only seedlings grown in the surface inch of soil showed severe depression of growth (except with neburon).

438. RUNGE, G. F., JR. **Nursery weed control.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (165–7). O.W.

Gives the results of experiments on weed control in nursery beds of many species with (1) simazine, (2) atrazine (2-chloro-4-isopropylamino-6-ethylamino-1,3,5-triazine), (3) diuron, (4) neburon, and (5) amino triazole. (1) and (2) granular both gave commercially acceptable control with no injury to the species tested; (3) gave good weed control with no injury except to newly transplanted *Taxus* spp., which showed slight symptoms of chlorosis; (5) was excellent for control of *Artemisia vulgaris*.

439. AHRENS, J. F. **Combinations of herbicides for weed control in Maple tree nurseries.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (131–6). O.W.

In trials of a large number of preparations as both post- and pre-emergence sprays against weeds in transplant beds of Crimson King Maples, it was found that a combination of simazine at 4 lb./acre and amitrol at 3 lb./acre applied as a post-emergence spray, gave 100% kill of existing weeds, and 100% control for the rest of the season, without affecting growth of the Maples.

440. AHRENS, J. F. **Chemical control of weeds in *Taxus* liners.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (155–60). O.W.

A number of herbicides were tested (1) on transplants of three varieties of *Taxus cuspidata* and (2) on transplant beds 6 days before planting the same varieties. In (2), CDEC (6 and 12 lb./acre) and EPTC (ethyl *N*, *N*-dipropylthiolcarbamate) controlled grasses for 5 weeks after transplanting but did not control *Polygonum pennsylvanicum* and *Chenopodium album*. Simazine (3 lb./acre) spray gave good control of both, and the spray was more effective than a granular application at 6 lb./acre. EPTC stunted two varieties of *Taxus* at the higher rate. Simazine and CDEC had no adverse effects on growth. In (1) control of broadleaved weeds and grasses was most effective with EPTC (4 or 8 lb./acre), CIPC (12 lb./acre), and simazine (6 lb./acre). Dinoseb at 5 or 10 lb./acre controlled the broadleaved weeds, but not the grasses. No significant decrease in transplant growth occurred.

441. FABER, H. Unkrautbekämpfung in Ziergehölzquartieren und Baumschulsaatbeeten. **[Weed control in woody ornamental nurseries and seedbeds.]** *Mitt. Biol. Bundesanst. Land- u. Forstw., Berl.* No. 97, 1959 (144–8). [G.] O.W.

Trials were made in nursery transplant beds, 4 days after transplanting, with (1) CIPC (7 and 5 kg./ha.), (2) mixtures of urea derivatives and carbamic-acid esters (1·3 and 2·5 kg./ha.), (3) simazine (0·5 and 1·5 kg./ha.) and (4) neburon (4 kg./ha.). Results are tabulated. Treatments with (2), (3) and (4) successfully reduced weeds without appreciable injury to the stock. In pre-emergence trials, (4) (1·5–2 kg./ha.) and (2) (0·8 kg./ha.) gave good results.

442. **[The use of simazine in nurseries.]** *Extr.* from *Årsskr. Norske Skogplantesk. 1959*, 1960 (113–5). [Nor.]

Notes by *R. Balvoll* and *M. Barkved* on the effect of 'Ugrasmiddel Geigy' used in seed- and nursery beds.

443. WATT, R. F. **A test of wood fibre pads as a seedbed mulch.** *Tree Plant. Notes* No. 41, 1960 (5–7).

Experiments have been made at Cloquet, Minn., in the use of loose pads of sulphite wood fibre as a seedbed mulch. Results indicate that even the lightest pads used (0·75 lb./cu. ft., 0·141 in. thick) prevented emergence, though they did not affect germination.

444. BLANKE, H.-K. Erfahrungen mit Baumschulfolien in einem Pflanzgarten. **[Experience with plastic films [for mulching] in a forest nursery.]** *Allg. Forstzeitschr.* 15 (30), 1960 (424–6). [G.]

Describes promising results after 2 years with black 0·08-mm. polyethylene foil 20 cm. wide, used between rows of Spruce transplants on beds in a new nursery on sandy loam, with heavy weed growth. Hardly any weeding was required, moisture was conserved, and the plants were taller, heavier in both root and aerial parts, and more vigorous than on the alternate, uncovered control beds. Assuming use of the foil for 4 years, savings per 1000 plants are estimated at > DM.17.

232.327. Protection Measures in Nurseries

See also Nos. 425–6, 434, 708–9, 711, 714, 763, 857.

445. BARKVED, M. Vern mot klimaskader i planteskolen i vinterhalvåret. **[Protection against climatic injuries in nurseries during winter.]** *Extr.* from *Årsskr. Norske Skogplantesk. 1959*, 1960 (21–31). 5 refs. [Nor.]

Deals mainly with frost damage. Discusses its physiological aspects, and reviews literature on reducing damage by application of K fertilizers or spraying plants with a solution of $Na_2B_4O_7$. Measures successfully used in the Etne nursery to reduce damage include shelterbelt planting, covering the plants with heather, sacking or plastic, or sprinkling with water throughout the winter.

446. BENJAMIN, D. M., DOSEN, R. C., and VOIGT, G. K. **The influence of biocidal treatment of nursery stock on insect attack of field planted Jack Pine.** *For. Res. Note Wis. Coll. Agric.* No. 58, 1960. pp. 4. 5 refs.

In 1953, 2 + 0 *Pinus banksiana* seedlings from 22 nursery beds treated with chlordane, calomel, Stoddard solvent, NPK fertilizers, leaf-mould, and combinations of these, at varying rates of application, were planted in random rows on flat, well drained terrain in Adams County, Wisconsin. At the end of the 1958 growing season, after a survey of insects on the trees, the commonest, the Jack Pine shoot borer (*Eucosma sonomana*), was chosen as indicator of the effect of treatment. Incidence of attack on control trees was 16·8%; that on treated trees varied from 16% (low rates of NPK) to 26% (medium rates of leaf-mould + fertilizer). In only 3 treatments, however, was the infestation of treated trees significantly greater than that of controls, viz. light rates of calomel, medium rates of NPK, and medium rates of leaf-mould + fertilizer. It is concluded that nursery treatments of this kind have no consistent significant influence on Jack Pine shoot-borer infestation 5 years after planting in the field.

447. RÜHM, W. Zur Bodenentseuchung in Forstbaumschulen und Forstkamps gegen pflanzenparasitäre Nematoden. **[Disinfestation of forest nurseries against nematodes parasitic on plants.]** *Repr.* from *Deutsche Baumschule, Aachen* 12 (4), 1960 (113–6). 5 refs. [G.]

Includes brief descriptions of tests with various

nematocides [cf. *F.A.* 21 No. 4176] and of a small-scale test in which *Tagetes patula* was grown in conifer plantations in a sandy, slightly loamy soil [cf. *F.A.* 21, p. 156]. In plots with *Tagetes*, the population of *Paratylenchus penetrans* was reduced by 77% but *Rotylenchus*, *Dorylaimus* and *Tylenchus* species were affected little or not at all, and the effect on *Tylenchorhynchus* spp. varied. Apart from its ineffectiveness against *Rotylenchus* spp., the method is considered uneconomic because the *Tagetes* must be grown for at least 4 months as a pure crop, since conifers cannot compete effectively with it.

232.328. Vegetative Propagation

448. TODA, R., and TUSIRO, A. **[Effect of planting *Cryptomeria* cuttings in muddy bed.]** *J. Jap. For. Soc.* 40 (9), 1958 (400–2). 1 ref. [Jap. jap.e.]

Describes the 'nerizasi' method of planting *C. japonica* cuttings, in which the top 10-cm. layer of the nursery bed is thoroughly wetted and hoed to a muddy consistency, the cuttings being then pushed through the muddy layer to the drier porous soil beneath. A significant reduction in the early mortality of cuttings was achieved by comparison with the conventional 'kuwazasi' or shallow-trench method.

449. REINES, M., and BAMPING, J. H. **Seasonal rooting responses of Slash and Loblolly Pine cuttings.** *J. For.* 58 (8), 1960 (646–7). 3 refs.

Cuttings were collected monthly for a year from 2- to 3-year Slash and Loblolly Pine trees, and treated with IBA or Rootone before planting. Examinations 5 months after collection showed that the rooting % was greatest in January, falling to a minimum in May and then rising again. Slash Pine at all times rooted more readily than Loblolly, and treated cuttings more readily than controls, Rootone giving a better response than IBA. [Cf. *F.A.* 18 No. 374.]

450. REINES, M., and MCALPINE, G. **The morphology of normal, callused, and rooted dwarf shoots of Slash Pine.** *Bot. Gaz.* 121 (2), 1959 (118–24). 10 refs. O.B.D.

Dwarf shoots, with and without chemical treatment, were placed in a rooting medium for 1 month or more, and were then studied for the morphological aspects of the callusing and rooting responses. The cortex and pith contribute largely to callus formation, but the cambial cells and xylem and phloem parenchyma are also capable of proliferation. Roots originate from finger-like protuberances of the callus, but excessive callus formation impedes root development. Buds develop from the apical meristem as early as 1 month after planting and in advance of root development. On rare occasions these buds succeed in forming new stems on rooted dwarf shoots. Individual needles are capable of callus formation and root development. *From authors' summary.*

451. NEGISI, K., YAGI, K., and SATOO, T. **[Studies in the growth of young plants of Poplar [*Populus japano-gigas*] arising from cuttings of different thickness. 1. Seasonal course in dry weight increment.]** *J. Jap. For. Soc.* 40 (10), 1958 (421–37). 3 refs. [Jap.e.*e.*]

Presents extensive graphical data showing the growth of young *P. japano-gigas* from cuttings of various thicknesses, as observed mainly by their changes in weight in the first season of growth.

452. OUELLET, C. E. L'enracinement des boutures d'ormes d'Amérique (*Ulmus americana* L.) sous un faible éclairement. **[Rooting cuttings of *U. americana* under reduced illumination.]** *Canad. J. Pl. Sci.* 40 (2), 1960 (248–58). 8 refs. [F.f.e.] O.R.E.

The main difficulty in rooting softwood stem cuttings, viz. premature leaf wilting, was controlled by reducing the natural light intensity in the greenhouse. Good results were generally obtained with ca. 1200 lux. It is believed that this treatment reduces the transpiration of cuttings and so favours rooting. The effect of illumination seemed to be influenced by: (1) the time when cuttings were taken—more illumination being advantageous at the end of the summer; (2) weather at the time when cuttings were taken—good rooting was still obtained with cuttings taken during very rainy summers and having a high m.c., even under illumination < 1200 lux; (3) age of parent trees—cuttings from old trees being more influenced by the degree of illumination than those from younger trees.

453. SEVEROVA, A. I. Novoobrazovanie kornja na steblevyh i steblja na kornevyh čerenkah bereskleta borodavčatogo. **[The formation in *Euonymus verrucosus* of roots on shoot cuttings, and shoots on root cuttings.]** *Trud. Inst. Les.* No. 37, 1958 (142–8). 3 refs. [Russ.]

Describes the processes, from which it is concluded that shoots are formed exogenously, and roots endogenously.

454. RUGGERI, C. **Root formation in cuttings of *Eucalyptus camaldulensis* Dehn [*E. rostrata*].** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/60-7a*, 1960. pp. 3. [E.] Limited distribution.

In view of the extreme difficulty found in rooting cuttings of *Eucalyptus* spp., a study was made of the process of root formation in *E. rostrata*, a species with which some success has been obtained [cf. *F.A.* 18 No. 3650]. Shoot cuttings 1, 2, and more years old were kept in water for ca. 2 months. Two types were observed: (1) those in which the cortex had a normal appearance, (2) those in which the cortex showed a ring of mechanical tissue whose elements were distributed along a discontinuous line broken by parenchymatous zones. In (1), callus formed in the usual way and led, by successive differentiation, to root formation. In (2), the cut caused proliferation with differentiation of sphaeroblasts both inside and outside the ring of mechanical tissue, and adventitious roots which emerged from these hyperplasias passed through the parenchymatic zones that separated the discontinuous tracts of the sclerenchymatic ring. These roots had a thick,

highly lignified core. Both pericycle and sphaeroblasts were absent away from the zone of root formation, and completely absent from cuttings that formed roots by callus differentiation or that formed no roots at all. [Cf. *F.A.* 21 No. 1722.]

455. GIORDANO, E. **Vegetative propagation of Eucalypts.** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/60-7c*, 1960. pp. 6. [E.] Limited distribution.

Satisfactory results were obtained by layering 2-year-old *Eucalyptus rostrata*; the only tending required was occasional watering. Cuttings of the same species rooted best when taken in February (64%), rates being much lower for April (27%), July (15%) and Dec. (12%).

456. KAWANA, A., and HARAGUCHI, T. **[Air-layering of Japanese Red Pine (*Pinus densiflora* Sieb. et Zucc.) (III).]** *J. Jap. For. Soc.* 40 (9), 1958 (398–9). 15 refs. [Jap.jap.e.]

Reports briefly on the changes in the total N and total carbohydrate contents of the shoots and needles of previously air-layered *P. densiflora* [see *F.A.* 19 No. 371].

457. AL'BENSKII, A. V. Otdalennye privivki u drevesnyh porod. **[Remote [interspecific and intergeneric] grafts in woody species.]** *Agrobiologija* 1960 (3), (396–401). [Russ.] I.M.I.

A brief account of intergeneric and interspecific grafting in some conifers and broadleaved species, and the performance of 'vegetative hybrids' so obtained and of seedlings raised from some of them.

458. LUBAN, E. Inmulţirea coniferelor pe cale vegetativă. **[Vegetative propagation of conifers by grafting.]** *Rev. Pădurilor* 75 (3), 1960 (149–51). [Rum.]

Gives results of experiments made at Bucharest with a number of ornamental conifers. No success was obtained with *Abies*, *Pinus* or *Picea*, but varying degrees of success were obtained with *Chamaecyparis lawsoniana* (65–75%), *Cryptomeria japonica* (58%), *Juniperus virginiana* (34%), *J. sabina* (41%), *J. communis* (94%), *Taxus baccata* (82%), and *Thuja occidentalis* (45–88%).

459. DUDIĆ, M. Oplemenjivanje crnog bora kalemljenjem. **[Improvement of *Pinus nigra* by grafting.]** *Šumarstvo* 13 (1/2), 1960 (29–34). 7 refs. [Serb.serb.e.]

Grafting experiments begun in 1952 with *P. nigra* [see *F.A.* 17 Nos. 458–9] were renewed in 1956 with similar results (ca. 40% take). In 1958, to raise this %, scions taken as before from exceptional trees at Crni Vrh, nr. Priboj, with a resin yield 600% and diam. increment 25% greater than average, were exposed to ionizing radiation from radio-active Co at 8 different doses from 50 to 1500 r units. Scions treated with each dose, and untreated controls, were grafted in a 3-year plantation at Mt. Maljen, Kozomor, in (1) early April, (2) late April, (3) mid-May. In (1), grafts treated with 1500 r units had most success, with 75% take. In (2), 50 r units gave best results, with 60%. In (3), the take was generally poor. Best over-all results were in (2). Controls showed only 40% take, agreeing with previous findings. When compared with (*a*) ungrafted seedlings near by, the needles of (*b*) grafted Pines were darker green, stiffer, thicker, 39·2% longer and 210% heavier, and generally showed superior vigour and growth. While (*a*) had 6–7 side branches in each whorl, (*b*) had 1, 2, or rarely 3. In 1959, 3 stems grafted in 1956 and 1 grafted in 1958 bore cones; this early fruiting is important for selection and hybridization work.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also Nos. 435, 1242.

460. HOFFMANN, K. Beobachtungen an Wurzeln eingetopfter Propflinge für die Anlage forstlicher Samenplantagen. **[The root systems of potted grafted plants in forest seed orchards.]** *Forst u. Jagd* 10 (6), 1960 (248–50). 4 refs. [G.]

After planting out, young grafted plants, particularly Pines, with rootstocks that had been grown for some years in pots before or after grafting, tended to retain a tight, spiralling root habit, with few short roots, unless the soil was very well cultivated.

461. KEIDING, H. **Budding and grafting of Teak (*Tectona grandis*).** [*Docum.*] *3rd Sess. FAO Teak Sub-Comm., New Delhi 1960* No. *FAO/TSC-60/3.3*, 1960. pp. 6 + 2 photos. 5 refs. Limited distribution.

Describes successful experiments (80% take) in bud-grafting of Teak by the 'forkert' method commonly used on *Hevea brasiliensis*. Bark patches containing a bud are grafted on to the exposed cambium of 2 + 0 stock in leaf. When the buds begin to sprout (in 2–3 weeks) the stock is cut back to the point of union. The method is promising for the establishment of seed orchards from good phenotypes.

462. **Nursery work [in Hong Kong's afforestation programme].** *Extr.* from *Rep. Dir. Agric. Fish. For. Hong Kong 1958/59*, 1959 (59–60). P.R.

More than half the nursery stock for afforestation in 1958 was tubed, including 80,000 *Tristania conferta* seedlings (normally very susceptible to damping off.) Tubed stock is clearly superior for afforestation in Hong Kong, and polythene plastic tubes are cheaper than and preferable to tubes of roofing felt or metal.

463. YATAZAWA, M., MATSUI, M., and WILDE, S. A. **Growth response of Monterey Pine to gibberellins.** *For. Res. Note Wis. Coll. Agric.* No. 52, 1960. pp. 2. 3 refs.

In trials with 16-month *Pinus radiata* stock, 24 seedlings 13·6 in. tall were treated with 0·2% gibberellin/lanolin paste, applied in a band ca. 4 mm. wide to the surface of the stems 2 cm. below the top. When measured 3 months later, the leaders of treated seedlings showed a mean height increment of 9·2 cm. vs. 3·3 cm. for controls.

232.33. Formation of Stands by Direct Sowing

See also Nos. 334, 390, 392, 489, 493–4, 497–8, 501.

464. WALLNER, O. Ny norsk såddapparat. [**A new Norwegian sowing tool.**] *Skogen* 47 (18), 1960 (341). [Sw.]

The tool (illustrated) weighs 2·5 kg. and comprises a scraper and a cutting blade to prepare the seed-spot, and two containers, one for seed, the other for fertilizer. Results of trials in 1959 were only moderately successful, presumably because of the abnormally dry summer, but trials will be continued in 1960. The tool proved easy to handle and reduced sowing time.

465. NIČOTA, B. Vlijanieto na klimatskite uslovi vrz direktnata setva na seminja vo zonata na prnar (*Quercus coccifera*). [**The influence of climatic conditions on direct sowing in the *Q. coccifera* zone.**] *Godišn. Šum. Inst., Skopje* 3 (3), 1958 (41–82). 23 refs. [Maced.e.]

A detailed account of experiments started in 1953–54 on the re-introduction of conifers by direct sowing in scrub near Gevgelija where native *Pineto-Quercetum cocciferae* had once grown. Extensive data on the locality and its climate are given. Seed was sown on the small plots ($\leqslant$ 1 sq. m.) either (*a*) between bushes and exposed in different compass directions or (*b*) under bushes. A 6-year study showed that of the 1953 sowings, *Pinus pinea* had the highest germination % and best survival % at all stages on (*a*) and (*b*), best height increment, and most tolerance of a S. exposure. Some promise was also shown by *P. halepensis*, *P. brutia* and *P. nigra* var. *pallasiana* on (*a*). Of sowings in 1954, an exceptionally dry year, *P. pinea* was again best on (*a*), but on (*b*) no seedlings of any species survived the study period.

466. BUDOWSKI, G. Siembra directa de 'laurel' *Cordia alliodora* sobre montoncitos incinerados. [**Direct sowing of *C. alliodora* on burned mounds.**] *Comun. cient. agríc. Inst. Interamer. Cienc. Agríc., Turrialba* (*Dasonomía*) Hoja No. 9, 1958. pp. 3. 1 ref. [Span.]

Trials were made in Costa Rica using a technique developed in Africa [see *F.A.* 18 No. 4029]. Out of 164 mounds sown (10–30 seeds/mound) on May 8th, by July 3rd 23 had 1 seedling each, 88 had between 1 and 20 seedlings each, 11 had > 20 seedlings each, and 42 had no seedlings at all.

232.4. Formation of Stands by Planting

See also Nos. 330, 392, 487 *et seq.*, 513, 919–20.

467. GODNEV, E. D. Ob agrotehničeskom uhode za lesokul'turami v lesnoj zone. [**Agricultural tending techniques in forest plantations in the forest zone.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (62–8). [Russ.]

Reviews results of planting Scots Pine and Norway Spruce in the Vladimir region. Concludes that, when furrow planting is done on areas where the worst weeds are absent, only very little weeding, or even none at all, will be necessary. Good planting stock, closer spacing, better soil preparation and careful planting will all reduce the need for weeding.

468. BELEVCEVA, O. V. Agrotehnika lesnyh kul'tur v taežnoj zone. [**Tillage techniques in establishing plantations in the taiga zone.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1938 (70–2). [Russ.]

Scots Pines planted on the overturned furrow slice did much better than those planted in the furrow.

469. ROE, E. I. **Restoring swamp conifers on brushy lowland requires adequate brush control, large stock, and careful planting.** *Tech. Note Lake St. For. Exp. Sta.* No. 584, 1960. pp. 2.

In planting trials with Black Spruce and Tamarack, on plots sprayed from the air with 2,4-D or left unsprayed on brushy Minnesota lowland, only Tamarack on sprayed plots showed fair survival (43%) and mean height (3·5 ft.). Important causes of mortality were hares, drowning, deep planting, and smothering by bluejoint grass. Survival and growth of Black Spruce 2 + 0 seedlings were inferior to those of 2 + 1 and 2 + 2 transplants. Recommendations are made for future plantings.

232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 481, 486, 491, 502.

470. MØLLER, P. Sortering af rødgranplanter. [**Grading Norway Spruce plants.**] *Dansk Skovforen. Tidsskr.* 45 (6), 1960 (225–34). 10 refs. [Dan.]

Presents results showing development in height and height increment for plants sorted by height as 2 + 0 or 2 + 2 plants in 1944 and 1946 respectively and examined at intervals until 1957. Results generally confirm those of Tulstrup [see *F.A.* 12 No. 253].

471. HAUGBERG, M. Sortering av granplanter i planteskolen. [**Grading Spruce plants in nurseries.**] *Extr.* from *Årsskr. Norske Skogplantesk. 1959*, 1960 (44–81). 16 refs. [Nor.]

The effect of grading on survival and growth of plants was studied in various nurseries in different years. Results varied with the district and with variations in weather from year to year, but general conclusions are that survival and growth during the first two years of 2 + 0 plants are better for larger plants (> 5 cm. tall) than for smaller ones, and that among plants < 5 cm. those with well developed root systems do better. Differences in height growth tend to even out later, but some difference can still be found 4–5 years after planting out. Considerable differences in survival and growth during the 7 years after planting out were found between plants graded by size before planting out as 2 + 2 plants.

472. STILINOVIĆ, S. Razmatranja o primeni nekih metoda za procenjivanje kvaliteta sadnog materijala u našim uslovima. [**Observations on the use of certain methods of evaluating the quality of planting stock in Jugoslavian conditions.**] *Šumarstvo* 13 (1/2), 1960 (49–55). 30 refs. [Serb.f.]

Discusses methods proposed in the literature (chiefly N. American) [cf. *F.A.* 21 No. 4318], concludes from trials that the success of transplants depends on the relation (1) between stem height and

diam. of root collar and (2) between weight of above-ground and below-ground parts of the plant, gives figures for these ratios for 2 + 0 *Pinus nigra* and *P. sylvestris* in Serbian nurseries, and discusses the significance of the findings for afforestation in Jugoslavia.

473. SZYMAŃSKI, S., SZCZERBIŃSKI, W., and GNIEWSZEW, I. Wpływ jakości sadzonek sosnowych na wysokościowe i morfologiczne różnicowanie się 4-letnej uprawy. **[Influence of Scots Pine seedling quality on the height growth and morphological differentiation of a 4-year-old plantation.]** *Sylwan* 104 (4), 1960 (17–33). 25 refs. [Pol.russ.e.]

The seedlings were graded into six quality classes by a method already described [see *F.A.* 15 No. 3525], and planted out. Measurements of height growth and branching made 4 years later were analysed statistically. The relationship between seedling quality (based on height) and subsequent height increment was valid only for the very first years; moreover, the proportions of cull plants and properly developed plants were virtually equal for all seedling quality classes. Branching proved to be a good criterion for assessing vigour, as seedlings with many strong side shoots retain this feature in later years and so produce trees with a fuller crown.

474. STUBBINGS, J. A. **Raising and use of large close-rooted transplants for commercial afforestation in Southern Rhodesia.** *J. S. Afr. For. Ass.* No. 32, 1958 (36–55). 1 ref. [E.e.afrik.]

Results of afforestation of 19,500 acres in the Melsetter district have shown that, particularly where there is rank grass and weed growth, large (15–20 in. tall) close-rooted transplants (i.e. those planted with a ball of original seedbed soil attached to the roots) are much superior to normal smaller ones, are preferable to open-rooted ones, and are cheaper than pot-grown ones. Nursery practice for raising *Pinus patula, P. elliottii, P. taeda, Eucalyptus saligna* and *E. maculata* is described in detail. Points described include: sowing individual seeds at the required 2 × 2-in. spacing except for finer seed such as that of *E. saligna,* which is sown broadcast; the use of raised and levelled seedbeds, 5–6 in. deep; early root-pruning, while the growing tip of the tap root is still brittle, followed by regular root-pruning at intervals of 3–4 weeks; and regular clipping of *Eucalyptus* spp. In local conditions, Pines are sown 12–15 months, and Eucalyptus 10–13 months, before the transplant will be needed. Equipment used is described and illustrated.

475. RODENBACH, R. C., and OLSON, D. F. **Grading Yellow Poplar planting stock is important.** *Res. Note Stheast. For. Exp. Sta.* No. 147, 1960. pp. 2. 1 ref.

Confirms earlier findings [cf. *F.A.* 16 No. 2959] that survival of *Liriodendron tulipifera* seedlings is related to root-collar thickness. For the Piedmont of North Carolina, 0·20 in. proved the minimum acceptable diameter on moist, good sites, and 0·25 on dry exposed sites. Height differences were not significant.

476. SZYMAŃSKI, B. Wstępne wyniki badań nad wpływem dołowania sadzonek sosny przez zimę na ich wzrost na uprawie. **[Preliminary results of tests on the effect of lifting Scots Pine seedlings for the winter, and their growth after planting out.]** *Sylwan* 104 (5), 1960 (73–81). [Pol.russ.g.]

Pine seedlings lifted in the autumn were kept through the winter in pits 2, 1·5, 1, and 0·75 m. deep, and on the surface of the ground. These treatments gave lower survival and height increment in the first two years after planting out, than for seedlings planted out direct from the nursery in the spring. There are, however, economic and other advantages in this method of winter storage which deserve to be considered.

477. SLOCUM, G. K., and MAKI, T. E. **Effects of desiccation on puddled versus bare-rooted Loblolly Pine (*Pinus taeda* L.) and Longleaf Pine (*P. palustris* Mill.) planting stock.** *J. For.* 58 (7), 1960 (528–31). 5 refs.

Longleaf and Loblolly Pine planting stock (*a*) bare-rooted and (*b*) with mud-coated roots, were subjected to desiccation in an unheated shed for 1½, 3, 6, or 12 days, after which they were planted in replicated randomized plots in the nursery. At the end of the first growing season it was found that survival of Longleaf (*b*) stock averaged 94·8%, and of Loblolly 100% vs. 80·4% and 92·8% respectively for (*a*). Duration of desiccation up to 12 days had no effect on (*b*); but for (*a*), survival of Longleaf dropped to 74% after 6 days and 50% after 12 days. Loblolly (*a*) stock held up well through the 6th day (98% survival) but by the 12th day had dropped to 66%. Shoot growth of Loblolly (*b*) stock [not measured on Longleaf] was unaffected by duration of desiccation, but with (*a*), 12 days of desiccation reduced current shoot growth 29% below (*b*). *From authors' summary.*

478. SØRLAND, T. Pakkeapparat for skogplanter. **[Packing equipment for forest plants.]** *Extr.* from *Årsskr. Norske Skogplantesk. 1959*, 1960 (109–11). [Nor.]

Describes, with illustrations, a wooden rack for use when transplant bundles are to be packed in a roll with first straw and then e.g. Birch branches round them. The rack consists of a fixed frame and a cradle that can be tipped sideways to permit easy tying and release of the package on to the ground.

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 255, 349, 474, 487.

479. AUSTIN, R. C., and STRAND, R. F. **The use of slowly soluble fertilizers in forest planting in the Pacific Northwest.** *J. For.* 58 (8), 1960 (619–27). 15 refs.

A detailed account of the background and results of experiments to increase the initial growth rate of conifer seedlings by placing pellets of slowly soluble fertilizers of varied formulation directly in the planting hole.

480. **Fertilization.** *Extr.* from *Rep. Dep. For. S. Afr. 1957/58*, 1960 (13).

A large fertilizer experiment was laid out at

Lottering plantation, on marginal soil, and planted with *Pinus radiata*. Various quantities of agricultural lime, rock phosphate, superphosphate and combinations of the three, were applied both before and after soil preparation on ploughed land and on land cultivated in patches. Five months after planting, survival was analysed, with results indicating that the method of cultivation and time of application had an important bearing on % survival. Survival on ploughed land was better where the fertilizer was spread after ploughing, and in holes, where the fertilizer was spread before making the holes. In general, survival was much higher for trees planted in holes than for those planted in ploughed land. The type of phosphate had no influence on survival, but survival was in inverse proportion to the quantity of lime applied.

481. JOBLING, J. **Establishment methods for Poplars.** *For. Rec. For. Comm., Lond.* No. 43, 1960. pp. 16 + 5 photos.

Results of fertilizer trials on fen peat and loamy sand in Norfolk, and heavy clay in Hampshire, with one-year rooted cuttings of *Populus* × *gelrica*, *P.* × *robusta*, *P.* × *serotina* and *P.* × *serotina erecta*, cut back to base and transplanted for one year, varied considerably. N, applied as a surface dressing of 4 or 8 oz. of $(NH_4)_2SO_4$ per tree, generally stimulated early height growth and thus increased the chances of survival, but its effect after the second season was less pronounced than that of P (as Ca superphosphate at 8 or 16 oz.) or K (as KCl at 4 or 8 oz.) worked into the planting soil. Larger doses and combinations produced little additional effect. In weed-suppression experiments, mulches of cut vegetation or straw laid 6 or 12 in. deep to a radius of ∢ 2 ft. round each tree and maintained for 3 years, stimulated height growth more than mounding, fertilizing, or soil cultivation. Early results of tests suggest that cut vegetation is more effective than bark peelings or empty fertilizer bags as mulch, though it does present a fire hazard and sometimes increases vole damage. At all three sites, one-year rooted cuttings cut back and transplanted for one year had the best survival rates, and two-year unrooted cuttings the poorest. [Cf. *F.A.* 22 No. 319.]

482. HOFSTEDT, B. Plantering med borr eller hacka? **[Planting with auger or mattock.]** *Skogen* 47 (16), 1960 (304–6). [Sw.]

Time studies were made in 1958–59 on planting 2 + 1 Spruce using the UHB-borr (auger) and the Boden-hacka (mattock). Factors affecting the degree of working difficulty were registered for each plant; they were: presence and concentration of logging slash (5 classes); roots (5 classes); humus (5 classes); stones (5 classes); and soil type (3 classes). Results show that the time taken for mattock planting was more affected than that for auger planting by increasing quantity of logging slash and stones. For a medium soil (class 2), and the easiest working conditions (class 1) for the other factors, the time taken in mattock-planting was 7% less than that in auger-planting. In the middle of the scale the differences evened out, and in the most difficult conditions mattock-planting took longer. Further investigations on planting 2 + 1 and 2 + 2 Spruce will be made in 1960.

483. ȚÎRCOMNICU, C. Executarea gropilor de plantat prin utilizarea burghiului mecanic de forat. **[Digging planting holes with a mechanical auger.]** *Rev. Pădurilor* 75 (2), 1960 (71–4). 3 refs. [Rum. russ.g.f.e.]

Describes experiments on two sites, using the 'Gribor' mechanical auger, driven by a single-cylinder, 3½-h.p. engine, total weight 46·3 kg., and operated by two men. It saved 15% in man-hours compared with hand tools. [Cf. *F.A.* 19 No. 395.]

232.43. Spacing and Arrangement in Plantations

See also Nos. 270, 515, 896, 921, 923.

484. SUVOROV, V. I. Teplovoj i vodnyj režim vozduha i počvy v kul'turah sosny obyknovennoj različnoj gustoty v uslovijah Buzulukskogo bora. **[Temperature and moisture regime of air and soil in *Pinus sylvestris* plantations of different density in the Buzuluk forest.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (130–43). [Russ.]

Tabulates data from investigations in 1954–56 on stand structure, air temperature and relative humidity, the temperature and moisture in the rooting zone, and the height and diameter growth of plantations established in 1948 at density (*a*) 6666, and (*b*) 40,000 seedlings/ha. M.a.i. (volume/ha) was significantly greater, and weed and *Melolontha melolontha* trouble less, in (*b*) than in (*a*). The mean air temperature on clear days in the growing season was lower during the evening, night, and morning in (*b*), and higher in the day. Relative humidity was higher, and wind speed significantly lower, in (*b*) than in (*a*). Soil temperatures were lower in (*b*). The rooting zone dried out much more in (*b*) than in (*a*). Fluctuations in annual height and diameter increment were less in (*b*) than in (*a*), but m.a.i. (height and diam.) was greater in (*a*).

485. SUVOROV, V. I. Vlijanie meteorologičeskih ėlementov na rost po diametru sosny obyknovennoj v čistyh kul'turah različnoj gustoty. **[Influence of meteorological factors on diameter growth of *Pinus sylvestris* in pure stands of different density.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (154–68). 8 refs. [Russ.]

Investigations in 1954–55 in stands planted in 1915 in a mossy Pine forest type at densities of (*a*) 8,800, (*b*) 26,300 and (*c*) 39,500 seedlings/ha. showed that m.a.i. (diam.) decreased with increasing plant density. In the period of 'individual growth' (i.e. before canopy closure) the amount of precipitation had no significant influence on diameter increment, but the latter was in direct relationship with the mean air temperature during the growing season. After canopy closure, annual diameter increment was directly related to the amount of precipitation, but increase in air temperature reduced increment. In stands (*a*) and (*b*) during canopy closure, there was a sharp drop in diameter increment, but not in (*c*). It is concluded that density (*c*) is best.

232.44. Season and Time of Planting

486. HEID. Über die günstigste Pflanzzeit der Douglasie. **[The best time for planting Douglas Fir.]** *Allg. Forstzeitschr.* 15 (37), 1960 (538–9). [G.]

In field plantings near Karlsruhe (mild winters) largely on diluvial sands, autumn-planted 1 + 2 stock survived and grew better than spring-planted stock. Planting method had no visible effect, but moisture conservation (largely by avoiding or shortening heeling-in) and frost protection (side shelter better than overhead shelter) were important.

233. Afforestation

See also Nos. 66, 73, 358–9, 361–2, 363, 393–4, 537, 893, 917, 1263, 1266, 1273.

487. LOWRY, G. L. **Conifer establishment on coal spoils as influenced by certain site factors and organic additions at planting time.** *Proc. Soil Sci. Soc. Amer.* 24 (4), 1960 (316–8). 6 refs.

Eight conifer species were planted on Ohio spoil banks at 5 locations of widely different site characteristics. At any one location 5 tree species and 3 root mulch treatments were tried. Mulch treatments were (*a*) no treatment, (*b*) steam-sterilized sawdust, and (*c*) unsteamed sawdust. One pint of mulch was placed in the tree root zone at planting time. Results of 2-year measurements indicated significant survival differences between tree species on all areas where average survival was > 10%. On acid spoils, Pitch Pine appeared best in terms of both survival and total height. Jack Pine, White Pine, and Ponderosa Pine were intermediate, while Shortleaf Pine was consistently poor. On mildly acid clay spoils, Northern White Cedar was best, while Eastern Red Cedar, Ponderosa Pine, and Jack Pine were intermediate. Significant differences due to mulch treatments were noted, especially on very strongly acid sandy soils where (*c*) showed a 90% increase in survival over (*a*); (*b*) resulted in some increase in survival on sandy areas, but a decrease in survival when used on areas high in silt and clay. No height differences resulted from these treatments. Certain site and soil factors were studied to determine their effect on survival. Of the factors studied, only moisture equivalent, sand content and reaction were significant. A prediction equation for survival is given. *From author's abstract.*

488. SZÖNYI, L. Bauxitdepóniák és iszapgödrök fásítása. **[The afforestation of bauxite spoil mounds and slime pits.]** *Erdész. Kutatás., Budapest* 6 (3), 1959 (1960), (165–206). 8 refs. [Hu.hu.russ.g.e.*russ.g.e.*]

The soils of bauxite spoil mounds are clayey, slightly alkaline, structureless, and poor in humus, and often deficient in P and K, but observation of natural vegetation, and excavation of root systems, show them to be suited to tree growth. They may be used as soft-fruit or stone-fruit orchards or afforested first with soil-improving or protective species (Alder, Birch, Poplars, Scots Pine) and later with valuable timber species (*Quercus cerris, Q. sessiliflora*) and Robinia. The possibility of afforesting slime pits differs on the margins, on the slopes, and in the bottoms. The sides tend to be very dry and only the bottom soil is wet all the year round; the deep pits are permanently filled with water. The surrounding forest should be left undisturbed, and planting should begin as soon as sliming has ceased, starting on the margin and the moister areas with a relatively favourable microclimate. Good-quality planting stock is essential. On the poorest sites, *Fraxinus ornus* and *Pinus nigra* var. *austriaca*, on better sites *Populus canescens, Q. sessiliflora*, and *Pinus sylvestris* will give satisfactory results. *Carpinus betulus, Tilia* spp., *Betula* spp. and *Alnus* spp., may be used as auxiliary species. *Salix* spp. should be planted on the banks of water-filled pits.

489. KAAR, E. Metsakasvatuse võimalustest Saaremaa looaladel. **[Possibilities of afforesting the alvars on [the island of] Saaremaa.]** *Eesti NSV Tead. Akad. (Zool. Bot. Inst.) Metsandusl. Uurim.* No. 2, 1959. pp. 236. 165 refs. [Est.russ.g.]

A detailed account of soil genesis, chemical and physical properties of the soils, and microclimate, of alvars [cf. *F.A.* 22 No. 300] with and without trees. Various site types are distinguished. Particular attention is paid to afforestation techniques, especially mechanized tillage methods. The main species, both in existing alvar forests and for afforestation, is Scots Pine. Preliminary trials in planting European Larch, Ash and *Betula verrucosa*, and direct sowing of *Quercus robur* and *Q. borealis*, have given satisfactory results. An initial plant density of 10,000/ha. is recommended, and early tending measures are outlined. There is a 12-page German summary.

490. SOLJANIK, I. Biljni pokrivač u slivu reke Pčinje i potreba njegove obnove u cilju borbe protiv erozijie. **[Vegetation cover in the Pčinje river basin and the need for renewing it for erosion control.]** *Šumarstvo* 13 (3/4), 1960 (189–200). 13 refs. [Serb.f.]

An account of the present vegetation and plans for rehabilitation of the Pčinje basin, an area of > 3000 sq. km. severely eroded after long misuse, the chief causes being deforestation for agriculture, and over-grazing.

491. ŞTEFĂNESCU, P. Împăduriri cu ienupăr de Virginia (*Juniperus virginiana* L.) în condiţiile staţionale ale terenurilor degradate din cîmpia şi zona de coline a Ardealului. **[Afforestation with *J. virginiana* under the site conditions of the degraded areas in the plains and hill zone of Transylvania.]** *Rev. Pădurilor* 75 (6), 1960 (321–4). 3 refs. [Rum.]

Gives details of trial plantings made in 1956 with planting stock of different ages and sizes, with and without protective shade. Better survival and growth were obtained with one-year than with 2-year seedlings, with small (< 25 cm.) than with large (> 25 cm.) 2-year seedlings, and with shaded than with unshaded plots. [Cf. *F.A.* 22 No. 362.]

492. HANBEKOV, I. I. Lesorazvedenie v gornyh rajonah. **[Afforestation in mountainous regions.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (5–18). [Russ.]

Extols the advantages of terracing in afforestation work in the Crimea and the Caucasus.

493. MAKARYČEV, N. T. Vyraščivanie dubovyh nasaždenij na krutyh sklonah v central'noj lesostepi. **[Growing Oak on steep slopes in the central forest-steppe zone.]** *Trud. Inst. Les.* No. 40, 1959 (95–142). 55 refs. [Russ.russ.]

In the territory of the Novosil Experiment Station in Orel province, there are large areas where gulley and sheet erosion are occurring as a result of past mismanagement (ploughing the steppe, felling the forests). Extensive data are given on the conditions for forest growth on the grey and light-grey soils of a dry valley. The history of afforestation with *Quercus robur* since 1924 is reviewed, particularly the methods employed, spring and autumn sowing, sowing depths, seedling survival and increment, plantation lay-outs, etc. Recommendations are made for future afforestation work.

494. PAMAY, B. Dursunbey Alaçam orman mıntıkasındaki yangın sahalarının ağaçlandırılması imkânları ve buna ait denemeler. **[Possibilities of afforesting burned areas in the Alaçam forest area near Dursunbey in W. Anatolia, and experiments to this end.]** *Zir. Vek. Orm. umum Müd. Yay.* No. 321, 1960. pp. 217 + 5 tbls., 1 map. 90 refs. [Turk.f.]

A greatly expanded version of work already noticed [see *F.A.* 15 No. 3541].

495. LIÉGEOIS, P. Observations sur la reforestation de terres arides au Kivu. **[The afforestation of dry soils in Kivu.]** *Bull. agric. Congo belge* 51 (2), 1960 (351–66). [F.du.]

A short account, with numerous photographs, of a 10-year experiment in erosion control by contour trenching, and fire exclusion—often enough in themselves to ensure natural revegetation—supplemented where necessary by planting *Eucalyptus* spp. and *Cupressus* spp.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also No. 257.

496. LEFTER, R., and MOROŞANU, O. Invazia plopolui, o formă nouă de degradare a pădurilor din podişul Sucevei şi retacerea lor. **[The Aspen invasion, a new form of degradation in the forests of the Sucevei plateau, and methods of restoring them.]** *Rev. Pădurilor* 75 (3), 1960 (145–9). 10 refs. [Rum.russ.g.f.e.]

Stands of Beech and Sessile Oak have been invaded by *Populus tremula* and *Salix caprea* as a result of badly managed regeneration fellings. The resulting Aspen stands, which are not suited to the site, have become severely infected with *Phellinus igniarius* butt rot [cf. *F.A.* 20 No. 3331]. They are now being treated by sanitation felling and underplanting with species better suited to the site, both conifers and hardwoods.

497. STEFĂNESCU, P. Unele probleme ale uscării arboretelor de stejar, situate pe soluri cu podzolire de hidrogeneză. **[Some problems of the death of Oak in stands on soils subjected to podzolization.]** *Rev. Pădurilor* 75 (3), 1960 (142–4). 6 refs. [Rum.russ.g.f.e.]

The author's proposal for improving such stands is to introduce a mixture of Hornbeam by direct sowing. Hornbeam succeeds Oak naturally in such conditions, and in the course of time produces soil conditions once more suitable for Oak, but the process can be speeded up by human intervention.

498. SAVIN, E. N. Opyt rekonstrukcii jasenevyh nasaždenij v zasušlivoj stepi. **[An experiment in the rehabilitation of Ash stands in the droughty steppe.]** *Soobšč. Inst. Les.* No. 10, 1958 (25–36). 12 refs. [Russ.]

Trials were made in the improvement of poor Ash plantations, established at the end of the last century, by introducing species (particularly Oak) better suited to the site. The most effective method was to clear strips up to 5 m. wide in the stands, and to plough them to a depth of < 40 cm. This ensures freedom from root competition by the Ash, and provides a suitable microclimate for young plants. In the strips, Oak was established by direct sowing,and *Acer platanoides* seedlings were planted 1·5 m. from the lines of Oak to form a kind of barrier between the Oak and the Ash.

499. KALINIČENKO, N. P. Bioékologičeskie osobennosti klena ostrolistogo i ego rol' v povyšenii hozjajstvennoj cennosti dubovyh nasaždenij v stepi. **[Bioecological features of *Acer platanoides* and its role in increasing the value of steppe Oak stands.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (84–122). [Russ.]

Presents extensive tabulated data on the growth of *A. platanoides* (both from seed and coppice) on various types of soil in the steppe zone and particularly on its role in improving Oak stands.

500. **Cover crops in young Cypress plantations.** *Extr.* from *Rep. E. Afr. Agric. For. Res. Organ. 1959*, 1960 (71).

Observation of an experiment started in 1954 was continued. The cover crops were introduced into a 1-year-old Cypress (*Cupressus* spp.) plantation in an endeavour to keep out the grass which often comes in as a result of heavy thinning and pruning. The two cover crops that have been most successful are *Tephrosia vogelii* (which is, however, rather short-lived and is now about at its end) and *Prunus salasii* [cf. *F.A.* 14 No. 3267], which gets better each year. *Centrosema pubescens* and *Pueraria javanica* proved complete failures. In some of the control plots, *Neoboutonia macrocalyx* has come in naturally and appears to be a very useful natural cover crop.

501. STĂNESCU, C. Ameliorarea pădurilor de fag şi ajutorarea regenerărilor naturale. **[The improvement of Beech forests by supplementing natural regeneration.]** *Rev. Pădurilor* 75 (3), 1960 (134–7). [Rum.russ.g.f.e.]

The methods that have been used, which are described in some detail together with results, are direct sowing of Spruce and Silver Fir, (*a*) from aircraft, (*b*) broadcast on unprepared soil, (*c*) broadcast on snow, (*d*) broadcast on hoed strips or patches, (*e*) broadcast after scarification, and (*f*) in spots of 60 × 80 cm. It is recommended that conifers should be introduced in the proportion of ca. 50% and other broadleaved species (Ash and Maples)

ca. 10%. The most satisfactory results, both technically and commercially, were obtained by (*e*); (*a*) is recommended only for very large, or very inaccessible areas.

502. VERDUZCO, J. Mejoramiento con 'laurel' *Cordia alliodora* de charrales y bosques degradados. **[Improving stony scrubland and degraded forest with *C. alliodora*.]** *Comun. cient. agric. Inst. Interamer. Cienc. Agric., Turrialba* (*Dasonomía*) Hoja No. 10, 1959. pp. 2. [Span.]

Reports a trial started in 1958 in Costa Rica. Wildings of *C. alliodora*, 6 months old and ⩽ 50 cm. high, were planted at a spacing of 4 × 4 m. on stony scrubland after a light burn, and at 3-m. spacing in cut strips 2 m. wide and 8 m. apart, in a degraded stand. Survival has been almost 100%, growth quite good, and the cost relatively low.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See also Nos. 255, 327, 491, 677 *et seq.*

503. STACKELBERG, S. VON. Motorisierte Kulturreinigungsgeräte. **[Power equipment for weeding plantations.]** *Forstarchiv* 31 (8), 1960 (139–40). 1 ref. [G.]

Technical data are presented, in this supplementary article [see *F.A.* 20 No. 484], on German portable power equipment: the Waldwiesel F 600 and F 300, the Stihl, the Dolmar CFR and CPR; and the Norwegian Jo-Bu 'Vielfrass' V 760.

504. SHIBA, H. **[On height growth and damages of young Larch forest in Hokkaido Instruction Forest (Report No. 1).]** *Rep. Kyushu Univ. For.* No. 13, 1959 (19–31). [Jap.e.]

Summarizes the conclusions reached in sampling surveys made in July 1958 to examine the growth processes of, and damage suffered by, 1- to 3-year Larch stands.

237. Amelioration of Forest Sites

See also Nos. 466, 479–81, 487, 515, 529–30, 659.

505. HUIKARI, O. Metsäojitettujen turvemaiden vesitaloudesta erikoisesti sarkaleveyden ja ojasyvyyden kannalta. **[The hydrology of drained peat sites carrying forest, in relation particularly to ditch spacing and depth.]** *Metsät. Aikak.* 1960 (6/7), (228–9, 232). [Fi.e.]

Ditches are now cut considerably closer than in the early days of forest drainage. Studies by the author have shown that evaporation, especially in dry summers, has a greater drying effect than seepage, and that the quantity of forest growth has a decisive drying effect. The deeper levels of the groundwater are not affected by drainage. It is concluded that ditch spacing is of greater importance than ditch depth. For efficient drainage, strip widths of 40 m. should only be used exceptionally, where site quality is below average. A ditch depth of 60–80 cm. is sufficient. *From author's summary.*

506. MESHECHOK, B. Om grøfteavstand og grøftedybde ved myrgrøfting. **[Spacing and depth of ditches in draining wet peatland.]** *Norsk Skogbr.* 6 (10), 1960 (373–8, 381). 10 refs. [Nor.e.]

Six experiments were made in 1955–58 to determine the drainage effect (depth of groundwater table in cm. measured at various points between the ditches) in relation to spacing and depth of ditches. The effect, expressed as a % of ditch depth, shows a significant negative correlation with distance between the ditches. Two figures, one for soligenous and one for ombrogenous bogs, were constructed to show the various combinations of depth and distance giving groundwater depths of 20 to 40 cm. for a constant rainfall figure, amounting to 300 mm. in June-September, with a formula for calculating the correction figure for normal rainfall amounts. The results may serve as a preliminary guide to spacings required.

507. KRAUSS, H. Die Methodik der Meliorationsmassnahmen im norddeutsche Diluvialgebiet. **[Soil amelioration techniques in the North German diluvial region.]** *Repr.* from *Waldbodenmelioration II, Berlin* 1958 (1–9). 22 refs. [G.]

Discusses, with examples, the value of cultivation (chiefly deep ploughing), fertilizers (chiefly lime), leguminous plants, other auxiliary crops (e.g. rye), and agricultural intercropping before re-planting, with special reference to Pine plantations.

508. TANABE, S. **[Effects of nutrition on the growth of forest trees (*Cryptomeria japonica* D. Don.).]** *Sci. Rep. Kyoto Prefect. Univ.* (*Agric.*) No. 11, 1959 (135–40). 3 refs. [Jap.e.]

Presents results of observations made on diameter and height growth after N, P, and K applications at different rates and on various plots of *C. japonica* in 1957–1959.

509. OBEL, R. Gjødsling av granskog. **[Use of fertilizers in Spruce forests.]** *Norsk Skogbr.* 6 (10), 1960 (383). [Nor.]

Presents tabulated results from two trials, with $Ca(NO_3)_2$ or complete fertilizer, showing that improvement in increment decreased with increasing site quality class, and that $Ca(NO_3)_2$ was more effective than complete fertilizer.

510. HAUSSER, K. Düngungsversuche zu Kiefern mit unerwarteten Auswirkungen. **[Pine fertilizer trials showing unexpected results.]** *Allg. Forstzeitschr.* 15 (34), 1960 (497–501). 10 refs. [G.g.]

In field trials with 20- to 30-year-old Pines of poor growth on poor, podzolized sandy soil of the bunter sandstone region of the northern Black Forest, removal of the dwarf-shrub layer caused a reduction of height growth which was not compensated for by treatment with lime and basic slag. Additional N treatments, repeated for 3 years, more than compensated for the initial check, and led to increased growth, better colour, and greater N content of foliage. Similar results were, rather unexpectedly, observed on 200-year-old trees on the border of one of the N plots, which showed an increase in ring-width of 100%, chiefly in the late-wood zone [cf. *F.A.* 21 No. 4942]. In a small-scale parallel trial, fertilized old Pines produced ca. 10 times the quantity of cones and 8 times the seed of controls [cf. *F.A.* 20 No. 4540]. Weight of 1000 seeds was ca. 25% greater but there was no difference in

germination rate, germination % or the development of young seedlings. *From author's summary.*

511. BOGGESS, W. R., and GILMORE, A. R. **The effect of residual fertility on the survival and growth of planted Pine in southern Illinois.** *For. Note Ill. Agric. Exp. Sta.* No. 91, 1960. pp. 7. 7 refs.

Loblolly, Shortleaf, Red and White Pine seedlings were planted in 1955 on plots used for fertilizer trials on agricultural crops from 1917 to 1954. Plots had received no treatment (*O*), manure (*M*), crop residues (*R*), limestone (*L*), rock phosphate (P), and muriate of potash (K), either singly or in combination. Examination in 1959 showed that all Pine species survived best with *O* or *R*. Survival was reduced by *M*, but even more by *L*. Survival with *R* was respectively 95, 92, 65 and 54% for the 4 species, vs. 40, 41, 25 and 9% for the *R* + *L*; addition of P and K further reduced survival. The low survival was due to heavy weed competition. Height growth was best with *M*, but the difference between this and *O* was statistically significant only for Loblolly and Red Pine. Except for Red Pine, growth was depressed by the addition of *L* to *M* and *R*. P gave a further reduction except with White Pine, which was not affected. The reduced height growth of some plots may be related to the competition, in which case the differences may tend to disappear.

512. MOSHER, M. M. **A preliminary report of irrigation and fertilization of Ponderosa Pine.** *Sta. Circ. Wash. St. Agric. Exp. Sta.* No. 365, 1960. pp. 5.

Measurement in summer 1959 of 90-year Ponderosa Pine irrigated and/or fertilized with NH_4NO_3 in 1957–58 showed an increased rate of growth compared with controls.

238. Timber Plantation Crops requiring Special Treatment

See also Nos. 319, 928.

513. JAIME FANLO, F. Técnicas modernas en la plantación y cuidados culturales del chopo. **[Modern techniques in the planting and tending of Poplars.]** *Montes, Madrid* 16 (93), 1960 (233–53). [Span.]

A summary of information on the cultivation of Poplars, including notes on selective breeding, nursery practice, the establishment of plantations, choice of varieties (with notes on some Spanish, French and Italian clones), spacing, rotation and tending.

514. MENDES, J. LAGRIFA. Le peuplier: l'état actuel du problème au Portugal. **[Poplar-growing: the present situation in Portugal.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/60/5-Dd*, 1960. pp. 7 + 1 tbl. [F.] Limited distribution.

Includes tabulated data on the species, clones, and cultivars identified in Portugal.

515. MAY, S. Culture intensive du peuplier dans une propriété sur du terrain de bonification à Codigoro. **[Intensive Poplar cultivation near Codigoro [Ferrara] on reclaimed land.]** Istituto di Sperimentazione per la Pioppicoltura, Casale Monferrato, Italy. [1960?] pp. 16. [F.] Limited distribution.

Describes the establishment of a 38-ha. plantation of Clone I 214 on reclaimed swamp near the Adriatic, dealing with drainage and irrigation, fertilizing, spacing, intercropping, etc. Enumeration at just over 5 years showed mean girths per row of 64 to 78·5 cm. according to spacing and soil, heights of 18 to 19 m. and total yields of 583 to 833 quintals/ha. corresponding to a gross return of Lire 175,000 to 250,000/ha./year.

24. Tending of Stands and Trees

See also Nos. 327, 344, 513.

516. HAVERAAEN, O. Avstandsregulering. **[Early regulation of spacing.]** *Tidsskr. Skogbr.* 67 (2), 1960 (49–97). 36 refs. [Nor.e.]

[Cf. *F.A.* 21 Nos. 1783–4.] Discusses earlier experiments and presents results after inspection in 1959 from some experiments laid out in young natural regeneration of Pine, Spruce, and a mixture of the two, in E. Norway in 1952–53. Tables and graphs show leader length, height increment, annual-ring width, b.a. increment, timber quality (knots), and amount of subsequent regeneration. Mean height and diam. increments in 1953–59 were higher on regulated than on untouched plots, the widest spacings (within the range 1·0–3·0 m.) giving the most increment. On plots spaced at 3·0 m., height increment during the first 6 years was about 40% and diam. increment 100% higher than on the controls. Variation in rainfall was responsible for variation in increment from year to year. Height increment was greatest in the trees that were tallest at the time of regulation. Wood quality (frequency and size of knots, and annual-ring width) decreased with increasing spacing, and treatment should be varied with the proposed use (e.g. pulpwood or timber) of the stand.

241. Cleaning

See also No. 594.

517. SCHIPPEL, H. R. Maskinell och manuell ungskogsröjning—en jämförelse. **[A comparison of cleaning young stands by hand or by power saw.]** *VSA-Redog. Fören. Värmlands Skogsarbetsstud.* No. 35, 1960. pp. 15 + 4 gphs., 1 manufacturer's leaflet. [Sw.]

Studies of relative times and costs were made in one 10- and one 30-year-old stand. One worker used both the hand tools (axe and saw) and the power saw. The results suggest that the use of the power saw is not economic for younger stands, and that for older stands there is little difference in cost per ha. between manual and mechanical cleaning. Pulse rates are, however, lower with mechanical cleaning. The material was too limited for any general conclusions to be drawn.

242. Thinning

See also Nos. 270, 380, 653, 906, 921–2.

518. O'CONNOR, A. J. **Thinning research.** *J. S. Afr. For. Ass.* No. 34, 1960 (65–88). 1 ref. [E.e. afrik.]

Develops the concepts of free growth, suppression and response put forward by the author in 1935 and

examines how far they could be used in evaluating the results of delay in thinning and how information from older existing stands could be used to replace observations on growth of young stands. *From author's summary.*

519. TIMOFEEV, V. P. K teorii rubok uhoda za lesom. **[The theory of intermediate fellings.]** *Trud. Inst. Les.* No. 37, 1958 (46–66). 25 refs. [Russ.]

Reviews and discusses Russian experience on thinning, with main reference to Oak and Larch.

520. ŠUMAKOV, V. S. Vlijanie rubok uhoda v čistyh sosnovyh molodnjakah na svojstva podzolistoj počvy. **[Influence of thinnings in pure Scots Pine thickets on the properties of podzolic soil.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 34, 1958 (140–57). [Russ.]

Tabulates data on the chemical and physical properties in 1947–1953 of the soil under a Scots Pine stand, thinned in 1939 at the age of 14 (24% of the volume removed), and again in 1946. Results indicate that this intensity of thinning does not cause any significant permanent beneficial changes in the properties of this podzolic sandy soil.

521. BUCKMAN, R. E., and ZASADA, Z. A. **Five-year results of a growing-stock density study in 85-year-old White Pine.** *Tech. Note Lake St. For. Exp. Sta.* No. 589, 1960. pp. 2.

A *Pinus strobus* stand was studied in the Pike Bay Experimental Forest, near Cass Lake, Minn. (site index ca. 55 ft. at age 50). The trees were comparatively free from blister rust (*Cronartium ribicola*) and tall enough for weevils (*Pissodes strobi*) not to damage the merchantable stem. In 1954, 6–8 ¼-acre plots were cut to each of the following densities: (*a*) 80, (*b*) 100, (*c*) 120, (*d*) 140 sq. ft. b.a./acre. Many suppressed and intermediate trees with a high incidence of red rot (*Fomes pini*) were removed. In 1959 the stand was re-measured and cut to the same densities, the trees removed being intermediates or co-dominants with little red rot. The growth rate over the 5-year period varied from 670 bd. ft./acre/year for (*a*) to 940 for (*d*); no consistent difference was established between (*b*), (*c*) and (*d*). Since this stand is already 10–20 years past the accepted culmination of m.a.i., these results suggest that *P. strobus* has the highest growth rate of northern conifers, and, where blister rust and weevils are not a problem, should have great management possibilities.

522. BUCKMAN, R. E. **High growth rate maintained by 140-year-old Red Pine.** *Tech. Note Lake St. For. Exp. Sta.* No. 587, 1960. pp. 2. 1 ref.

In a thinning study on a medium site in Minnesota, 3 plots were thinned in 1926 to 125–145 sq. ft. b.a./acre and 6 times subsequently to means of (*a*) 78, (*b*) 94 and (*c*) 120 sq. ft. Little apparent difference in the growth rate of the 3 stand densities has resulted. In the period 1926–59, plots (*a*) and (*b*) show a mean rate of almost 500 and (*c*) of 475 bd. ft./acre/year; there has been no conspicuous decline in increment with advancing age; and almost 22,000 bd. ft./acre have been cut as thinnings. The experiments will be continued for some years, since the stands show a high sustained growth rate at the greatest age (140 years) commonly suggested for Red Pine rotations.

523. ZAHNER, R., and WHITMORE, F. W. **Early growth of radically thinned Loblolly Pine.** *J. For.* 58 (8), 1960 (628–34). 4 refs.

Reports on the first 5 years of a study begun in 1954 in south Arkansas to determine whether good-quality *Pinus taeda* can be grown on a short rotation. Plots in a 9-year plantation were thinned in 3 treatments: (*a*) 100 crop trees per acre (for sawlogs only); (*b*) all trees removed whose crowns were within 5 ft. of the crowns of 100 crop trees per acre, with a further pulpwood thinning to release crop trees in 1957 (sawlogs and pulpwood); (*c*) conventional pulpwood thinning. After 5 years there was no significant difference in height among treatments, but d.b.h. had increased 4·3 in. in (*a*) vs. 3·4 and 1·9 in. for (*b*) and (*c*).

524. BENNETT, F. A. **Height growth pattern and thinning of Slash Pine (*Pinus elliottii* var. *elliottii*).** *J. For.* 58 (7), 1960 (561–2).

Analysis of available data for dominant *P. elliottii* stands indicates that, after a certain age, crown length cannot be appreciably increased through additional height growth, and consequently crown ratio % cannot be materially increased by release. Lateral growth of crowns during the period of restricted height growth is strictly limited. If crown area cannot be effectively increased, diameter growth can be stimulated by thinning only through a reduction in competition for moisture and nutrients and/or through increased photosynthetic activity as a result of added light. Chances for increased photosynthesis are, however, limited in the case of dominants. It is concluded that thinning should aim at achieving the optimum crown ratio by the age of 35 years, since any subsequent thinning will do little if any more than maintain the established diameter growth rate.

525. RADULOVIĆ, S. Prilog pitanju nege bukovih šuma u Srbiji. **[Tending of Beech forests in Serbia.]** *Šumarstvo* 12 (9/10), 1959 (471–83). 6 refs. [Serb.f.]

High forest constitutes 16·06% of the wooded area of Serbia; of this 86% is < 80 years old, and plantation and regeneration programmes are adding to this category. As thinning was not previously practised in Serbia, two trial plots have been established. The plots are described and the results of the first thinning given.

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See Nos. 314, 337, 521, 539, 689, 692–8, 700, 840.

245. Tending of Trees, Pruning etc.

See also No. 594.

526. OWEN, F. W. **A new aid for the teaching of pruning.** *Proc. Amer. Soc. Hort. Sci.* 74 1959 (101–5). From *abstr.* in *Biol. Abstr.* 35 (12), 1960 (No. 30858).

Describes a model tree with removable limbs for teaching the correct pruning of fruit trees etc.

527. KORSTIAN, C. F., and BILAN, M. V. **Further results of bud and twig pruning of Loblolly Pine.** *J. For.* 58 (8), 1960 (648–9). 5 refs.

In tests begun in a 6-year Loblolly Pine plantation and continued for 4 years, (*a*) complete removal of lateral buds and twigs, and (*b*) the same, but leaving the lowest complete whorl, caused loss in diameter and height increment (growth with (*a*) was significantly less than with (*b*)), excessive epicormic branching, and poor form. [Cf. *F.A.* 18 No. 2854.]

25. Treatment of Defective, Derelict or Very Open Stands

See Nos. 259, 330, 465, 496–8, 502.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

See also No. 321.

528. POPENOE, H. **Effects of shifting cultivation on natural soil constituents in central America.** *Abstr. of thesis*, in *Dissert. Abstr.* 20 (12), 1960 (4473–4). O.R.S.

Results of a study on mountain slopes bordering the Polochic Valley, Guatemala, showed that the most obvious soil changes accompanying removal of forest by felling and burning were in decreased N and organic-matter contents and in exchange capacities. N and organic matter were, however, high, and the slight reduction probably would not affect plant growth. Revegetation of abandoned clearings by second growth restores the lost N and organic matter. Exchangeable cations (excluding H) and pH are somewhat increased by felling and burning, but the effect is short-lived because of leaching and erosion. Bulk-density values are increased when forest is removed, but all values are exceptionally low, and do not limit crop production. Erosion is very slight. Young second growth in most places has slightly restored original forest conditions, though P contents decline. Cleared fields are generally more fertile than soils under forest, but continued crop production without fertilizers would soon deplete the temporary supply of nutrients released by burning. Shifting cultivation appears to be a very conservative agricultural practice in the valley, where the forests have no commercial value, and, at its present level, to cause no permanent injury to the soil; increasing population pressures will probably result in impoverishment of the soil and increased erosion.

262. Fuel and Fodder Forests

See No. 345.

263. Irrigated Forests. Forests subjected to Flooding or Seepage (*Auewald*)

See also Nos. 103, 238, 297, 512.

529. SEREBRJAKOVA, L. K. Rost i razvitie lesnyh kul'tur v Sarpinskoj nizmennosti pri orošenii. **[Growth of plantations in the Sarpa depression, with irrigation.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (47–61). [Russ.]

To work out methods of establishing irrigated stands near the Volga-Don canal, experimental plantings of *Elaeagnus angustifolia*, *Fraxinus pennsylvanica*, *Populus nigra*, *Robinia pseudoacacia* and *Ulmus pumila* var. *arborea* were made in 1953 on three different types of soil. Data are tabulated on the height and diameter growth of the trees; the residual and mid-day moisture deficit of the leaves in relation to r.h., original leaf m.c., and available moisture; and the course of dry-matter accumulation in the plants. Determination of the residual moisture deficit of the leaves and the degree of stomatal opening was found to be a good method of establishing the water requirements of the plants, and thus the irrigation schedule necessary.

530. SOZYKIN, N. F. Poliv lesnyh nasaždenij. **[Watering forest stands.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (73–83). [Russ.]

An account of investigations on furrow irrigation in establishing young stands, embracing four variants of furrow depth, width, and configuration. Small furrows (10–20 cm. deep) between the rows were best on soils of medium infiltration capacity on level ground; ploughed furrows with the trees planted in the furrow bottom were suitable for light and medium soils, especially on uneven areas. On heavy, saline soils, irrigation should be done via broad (130–160 cm.) furrows with the trees planted on the sloping edges of the furrows.

265. Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees

531. PREVOSTO, M. Coltura di ripa del pioppo e sua influenza sulla produzione di alcune piante erbacee. **[The effect of Poplar-growing along field borders on the yield of some herbaceous crops.]** Istituto di Sperimentazione per la Pioppicoltura, Casale Monferrato, Italy. [1959?] pp. 14 + 2 gphs., 3 dgms., 2 tbls. 12 refs. [It.f.e.] Limited distribution.

First results of a continuing study in the Po valley suggest that the yield losses in square 1-ha. fields surrounded by Poplars are < 10%—worth less than the yield from the trees. The yield depression due to Poplar rows 15–20 m. high at 7–10 years of age was greatest in the first 5 m., disappearing at 20–25 m. It was least on N. borders (no shade effect).

532. JOVANOVIĆ, S. Značaj linealnih zasada topola brzog rasta u sklopu poljezaštitnih pojaseva i plantaža. **[The significance of planted lines of fast-growing Poplars in the complex of shelterbelts and plantations.]** *Šumarstvo* 13 (1/2), 1960 (3–14). 12 refs. [Serb.f.]

Includes discussions of: the role of trees lining roads in securing uninterrupted communications, i.e. by giving shelter from snow or improving drainage; choice of clone or species with regard to soil, prevailing wind, type of road, amenity and safety of travellers; and the length of existing roads

in Serbia by districts, with an indication of site class and possible timber production.

533. KARSCHON, R. **Deposit and grain-size distribution of wind-borne sand as affected by Eucalypt roadside plantations.** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/60-7e*, 1960. pp. 3. 2 refs. [E.] Limited distribution.

Notes on the effect of a 7-year-old roadside plantation of *Eucalyptus rostrata* in Israel, which acted as a sand trap and caused an accumulation of sand on the highway.

266. Shelterbelts, Windbreaks

See also Nos. 59, 532, 1259.

534. CABORN, J. M. **The planning of shelterbelts. Design and structure.** *Scot. For.* 14 (3), 1960 (123–9).

A general discussion.

535. SIMUNOVIĆ, M. Poljezaštitni pojasevi na mediteranskom i submediteranskom kršu. [**Shelterbelts on the mediterranean and submediterranean karst.**] *Šumarstvo* 13 (3/4), 1960 (161–76). 11 refs. [Croat.f.]

Shelterbelts to prevent wind erosion are essential if agricultural conditions are to be improved on the degraded soils of the karst. Since the *bura*, the prevailing N.-N.E. wind, blows all the year round, evergreen species such as *Cupressus sempervirens* var. *horizontalis*, *Pinus halepensis*, *P. brutia*, and *P. nigra* must be planted; experimental belts of these are illustrated. Further recommendations cover: the establishment of stations for wind study; design of shelterbelts (with diagrams); the use of fruit-trees on the N. side (which is both exposed to wind and in the shade) and rosemary on the S. side of belts; shelterbelt networks; selection of seedlings and age of planting; deep ploughing and use of fertilizers; and weeding and watering of planted seedlings during establishment.

536. GIULIMONDI, G. **Observations on cultivated soils adjacent to Eucalypt windbreaks.** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/60-10b*, 1960. pp. 3. [E.] Limited distribution.

Describes the lay-out and preliminary results from long-term measurements of soil moisture at a depth of 30–35 cm. at various distances (3, 5, 9, 17, and 25 m.) from shelterbelts in the Agro Pontino (3 rows of 25-year-old *Eucalyptus* × *trabutii*) and near Catania in Sicily (20- to 40-m. wide, 30-year-old *E. rostrata*).

537. RODE, A. A. Opyt organizacii kompleksnyh biogeocenotičeskih stacionarnyh issledovanij. [**The organization of ecological team studies at permanent stations.**] *Trud. Inst. Les.* No. 37, 1958 (34–45). 5 refs. [Russ.]

Discusses the subject on the basis of personal experience obtained in investigating methods of growing shelterbelts and plantations in the semi-desert of the N.W. Cis-Caspian lowland, 5 km. S.W. of Dzhanybek and 30 km. N. of Lake Elton.

538. KOŽEVNIKOVA, S. A. Nekotorye osobennosti mikroklimata lesnyh nasaždenij po issledovanijam v Sal'skoj lesnoj dače. [**Some features of the microclimate of forest stands in the Sal'sk forest district [Rostov region].**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (144–60). [Russ.]

Investigations in, between, and near Oak shelterbelts in summer 1951 and 1952, showed that the chief effect of the trees was to lower the air temperature of the adjacent open areas.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also Nos. 72–3, 677 *et seq.*, 742, 1270–7.

539. EHRENREICH, J. H., and CROSBY, J. S. **Herbage production is related to hardwood crown cover.** *J. For.* 58 (7), 1960 (564–5).

A study made in mixed hardwood stands in the Missouri Ozarks showed that most of the herbage increase consequent on reduction of crown cover is obtained when the tree cover is reduced to well below 50%.

540. ***Leucaena glauca*** [**as a forage species**]. *Rural Research in C.S.I.R.O., Melbourne* No. 29, 1959 (12–4). 1 ref.

A general account of work on *L. glauca* in Australia [cf. *F.A.* 21 No. 1813].

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

See also Nos. 151–2, 418.

541. **Forestry Commission Guide. Westonbirt Arboretum.** Her Majesty's Stationery Office, London. 1960. pp. 6. Price 6*d.*

542. HANSELL, D. E. **The John T. Tyler arboretum has an historical background.** *Gdn. J. N.Y. Bot. Gdn.* 10 (3), 1960 (108–12, 114).

A short history of the arboretum near Lima, Pa., founded in the mid-19th century by private owners and bequeathed to a trust for the use of the public in 1945.

543. LIDDICOET, A. R., and RIGHTER, F. I. **Trees of the Eddy Arboretum, Institute of Forest Genetics, Placerville, California.** *Misc. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 43, 1960. pp. 41. 14 refs.

An expanded and up-to-date account [cf. *F.A.* 10 No. 2389] of the Arboretum, which contains a large collection of Pines, including 72 species, 35 varieties, and 90 different hybrids. These are listed with details of natural range and flower production. Pines that have failed, other species growing in the Arboretum, and climatic data for the locality are listed separately.

544. SALTER, R. G. **Trees and buildings in urban areas.** *Quart. J. For.* 54 (3), 1960 (208–20). 1 ref.

Discusses various aspects of the problem of urban trees, in an endeavour to reconcile the justifiable demands of the residents for light and sunshine with the added amenity that well grown trees undoubtedly give to any housing area.

545. SAY, J. S. **Trees for all.** *N.Z. J. Agric.* 100 (4), 1960 (365 . . . 373). O.R.E.

A semi-popular article, containing an annotated list of 56 deciduous, semi-deciduous, and evergreen trees suitable for street planting in New Zealand.

546. WYMAN, D. **Select list few, Lindens important as shade trees.** *Amer. Nurserym.* 112 (1), 1960 (22–3, 76 . . . 82).

Lists, with brief notes on habit, height, hardiness, etc. 16 *Tilia* species and varieties recommended for use as shade trees in the U.S.A. and 40 considered unsuitable.

28. Husbandry of Forest Products Other than Wood

281. Christmas Trees

547. DUNCAN, D. P., *et al.* **A study of consumer preference in Christmas trees.** *J. For.* 58 (7), 1960 (537–42). 2 refs.

A study made in Minnesota.

282. Bark Crops

548. PETZOLD, G. Künstliche Verlängerung der Lohzeit in Fichtenbeständen. [**Artificial extension of the period of (tan) barking in Spruce stands.**] *Forst u. Jagd.* 10 (8), 1960 (379). [G.]

In a 90-year stand, band-girdling in May or June resulted in ca. 2 weeks' extension of the period of barking (from mid- to late August) at little extra cost.

549. Rapport national: Italie. [**National report [on cork-growing]—Italy.**] [*Docum.*] *5th Sess. Wkg. Party on Cork Oak FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/LG/*60/4, 1960. pp. 17. [F.] Limited distribution.

550. Informe nacional: España. [**National report [on cork-growing]—Spain.**] [*Docum.*] *5th Sess. Wkg. Party on Cork Oak FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/CSM/LG/*60/5, 1960. pp. 42. [Span.] Limited distribution.

551. SAMPAIO, J. SALAZAR, and ROSA, L. VALENTE. Portugal: production de liège en forêt. [**Portugal: production of cork in the forest.**] [*Docum.*] *5th Sess. Wkg. Party on Cork Oak FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/LG/*60/3-*D*, 1960. pp. 13. [F.] Limited distribution.

552. Rapport national: Maroc (2ème partie). [**National report [on cork-growing]—Morocco (Part 2).**] [*Docum.*] *5th Sess. Wkg. Party on Cork Oak FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/LG/*60/7-*B*, 1960. pp. 3. [F.] Limited distribution.

553. Rapport national: France (Algérie). [**National report [on cork-growing]—France (Algeria).**] [*Docum.*] *5th Sess. Wkg. Party on Cork Oak FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/LG/*60/8, 1960. pp. 3. [F.] Limited distribution.

554. Rapport national: Tunisie. [**National report [on cork-growing]—Tunisia.**] [*Docum.*] *5th Sess. Wkg. Party on Cork Oak FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/LG/*60/6, 1960. pp. 3. [F.] Limited distribution.

283. Fruit and Seed Crops etc.

555. INAL, S. Palamut meşesi ormanlari coğrafi yayilişlari, ekonomik önemi ve amenajman esasları. [**Valonia Oak (*Quercus aegilops* L.) forests: their geographical distribution, economic importance and the fundamentals of their management.**] *Zir. Vek. Orm. umum Müd. Yay.* No. 280, 1959. pp. 372 + 2 maps. 120 refs. [Turk.g.]

A revised version of work already noticed [see *F.A.* 16 No. 1771].

284. Crops Tapped for Exudations etc.

556. Le gemmage—aspects techniques et économiques: France. [**Resin tapping—technical and economic aspects: France.**] [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/*60/7-*G*, 1960. pp. 5. [F.] Limited distribution.

557. Le gemmage: aspects techniques et économiques: Italie. [**Resin tapping—technical and economic aspects: Italy.**] [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/*60/7-*E*, 1960. pp. 4. [F.] Limited distribution.

558. NÁJERA, F. La resinación: aspectos técnico y económico: España. [**Resin tapping—technical and economic aspects: Spain.**] [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/*60/7-*B*, 1960. pp. 13. [Span.] Limited distribution.

559. **Resin tapping—technical and economic aspects: Yugoslavia.** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/*60/7-*A*, 1960. pp. 3. [E.] Limited distribution.

560. Le gemmage: aspects techniques et économiques: Grèce. [**Resin tapping—technical and economic aspects: Greece.**] [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/*60/7-*I*, 1960. pp. 2. [F.] Limited distribution.

561. VINOGRADOV, L. N. Novyj vzdymočnyj ogibajuščij hak konstrukcii I.A. Širjaeva. [**A new tapping hack designed by I. A. Širjaev.**] *Gidrol. lesohim. Prom.* 12 (5), 1959 (27). [Russ.] P.R.

The advantage of this hack over the No. 5 hack [see *F.A.* 20 No. 4603] is that it makes a very narrow freshening on both 'ribbed' and 'corrugated' faces.

562. OLOVENIKOV, G. B. Novye instrumenty dlja provodki želobkov. [**New tools for making gutters [in tapping].**] *Gidrol. lesohim. Prom.* 12 (3), 1959 (21–2). [Russ.] P.R.

Describes, with illustration, an improved (1959 model) Russian hack.

563. OLOVENIKOV, G. B. Podsočka odnostoronnymi karrami. **[Tapping with one-sided faces.]** *Gidrol. lesohim. Prom.* 12 (4), 1959 (24–5). [Russ.] P.R.

With the hacks now available [cf. *F.A.* 20 No. 4603] a length of 50–60 cm. can be freshened in one movement. Accordingly, the adoption of a pair of faces on one side of the tree (illustrated) is advocated instead of two opposite faces. These are separated by an interspace of bark, 12–15 cm. broad, flanked by vertical gutters, and a wider strip of bark is left on the other side of the tree. Such paired faces enable higher daily output by the tapping gangs because less time is spent in moving round the tree.

564. BEDENKO, V. F. Shema založenija karr pri 10-letnej podsočke sosny dlja rajonov Vostočnoj Sibiri. **[Plan for faces in 10-year tapping [cycles] with Pine in E. Siberia.]** *Gidrol. lesohim. Prom.* 12 (7), 1959 (27–8). [Russ.] P.R.

In E. Siberia the upper face in two-storey working gives greater yields in the first half (*a*) of the season, and the lower in the second half (*b*). Accordingly, in the first tapping season (of a 10-year cycle), an ascending, 'ribbed' face is used for (*a*), and in (*b*) this is extended downwards as a descending 'corrugated' face. Each half of the resulting double face is similarly extended each year. For the first 4 years of the cycle chemical stimulants should not be used on such a face.

565. NIKOLAEV, I. F., *et al.* Sposob podsočki s sernoj kislotoj s odnovremennym naneseniem podnovok. **[A tapping method using freshenings made on a single occasion before the start of the season, and successive applications of H_2SO_4 during the season.]** *Gidrol. lesohim. Prom.* 12 (6), 1959 (11). [Russ.] P.R.

A short account of trials with the method, which increases the efficiency of labour and makes work easier. At present the new method is recommended for the first half of the tapping season, followed by conventional tapping with H_2SO_4.

566. ŠUL'GIN, V. A. Podsočka s primeneniem sernokislotnoj pasty v uslovijah Karel'skoj ASSR. **[Tapping using H_2SO_4 paste in the Karelian A.S.S.R.]** *Gidrol. lesohim. Prom.* 12 (5), 1959 (23). [Russ.] P.R.

Presents data on resin yields obtained during tapping trials in 1958, which, contrary to the general opinion, indicate that yields in Karelia can be almost as high as in the S. and central parts of the U.S.S.R.

567. GORDEEV, A. V. Ustojčivost' sosny krymskoj k podsočke. **[Ability of *Pinus nigra* var. *caramanica* to withstand tapping.]** *Gidrol. lesohim. Prom.* 12 (5), 1959 (11–4). [Russ.] P.R.

[Cf. *F.A.* 16 No. 1786.] Investigations were made in 1958 on the rate at which faces become occluded, the condition, diameter increment, etc. of trees of various ages previously tapped by the descending, French and modified French methods, on the sands of the Lower Dnieper, Lower Don, and in the Crimea. None of the trees showed any sign of weakness, even those on site class IV–V which had been tapped for 3 years by the two-storey method [see *F.A.* 18 No. 4093]. The importance of this species for the resin industry of the U.S.S.R., especially in the dry southerly areas, is emphasized.

568. TRIFUNOVIĆ, D. Istraživanja uticaja smolarenja na prirast crnog i belog bora na Deliblatskoj Peščari i Semegnjevskoj Gori (Zlatibor). **[The influence of resin-tapping on the increment of *Pinus nigra* and *P. sylvestris* on the Delibato dunes and in Semegnjevo forest (Zlatibor).]** *Šumarstvo* 12 (9/10), 1959 (431–41). 10 refs. [Serb.f.]

Four trial plots (populations varying from ca. 80 to 570 trees) were established in areas where research was in progress on resin yields. On each plot some trees were tapped and some untapped. A statistically controlled evaluation of increment, covering a period of 6 years, showed that in 3 of the 4 plots there was no significant difference between tapped and untapped trees. On the 4th plot, tapped trees showed significantly greater diameter increment while height increment remained equal.

569. ORLOV, I. I. O smoloproduktivnosti sosny i kedra i metodah ee opredelenija. **[The resin productivity of *Pinus sylvestris* and *P. sibirica*, and methods of determining it.]** *Gidrol. lesohim. Prom.* 12 (3), 1959 (12). [Russ.] P.R.

Proposes the use of the following expression for assessing the resin productivity of a tree or species: weight (in g.) of resin obtained per 100 c.c. of wood removed in tapping, divided by the number of days in the tapping season. Using this criterion, the productivity of *P. sylvestris* in the S. Urals (3·18 g.) and *P. pinaster* in the Landes, France (3·3 g.), is compared.

570. BENGTSON, G. W., and SCHOPMEYER, C. S. **A gum yield table for ¾-inch, acid-treated streaks on Slash Pine.** *Res. Note Stheast. For. Exp. Sta.* No. 138, 1959. pp. 2. 3 refs.

The table, replacing an earlier one [cf. *F.A.* 16 Nos. 1784–5] for the ⅝-in. streak no longer used, shows first-year yields for trees of 6 diameter classes (9–15 in.) and 5 crown-ratio classes (0·2–0·6) with faces ⅓ of the stem girth and ¾-in. bark-chipped streaks sprayed with 50% H_2SO_4, worked bi-weekly, and is based on 1306 trees aged 19 to 45 years from 10 plots with site indexes of 72 to 99 ft. Analysis of the data showed that first-year resin yield depends primarily on diameter, and that crown ratio also affects it. No effect could be demonstrated for either site index or tree age within the observed range, after the yields were adjusted for differences of diameter between trees.

571. CEJTLIN, L. I. Ob ėkonomičeskoj celesoobraznosti podsočki eli. **[The economic feasibility of tapping Spruce.]** *Gidrol. lesohim. Prom.* 12 (3), 1959 (24–5). [Russ.] P.R.

Presents data on resin yields and labour requirements in tapping Spruce in Latvia by the intensive method [cf. *F.A.* 16 No. 3032; 21 No. 4423]. Improvements will have to be made in the resin-processing industry, and modifications will be necessary in forest management, but large-scale tapping of Spruce appears economically feasible.

572. USTINOVIČ, B. P. Vovleč' v podsočku listvennicu. **[The desirability of tapping Larch.]** *Gidrol. lesohim. Prom.* 12 (7), 1959 (13–4). [Russ.] P.R.

Reviews briefly the enormous reserve of mature and overmature Larch in the U.S.S.R., the history of Larch tapping in Central Europe, and experiments in the U.S.S.R. since 1924. It is calculated that if only 2·5% of the area of Larch were tapped (i.e. ca. 5½ million ha.), at a mean yield of 30 kg./ha., the annual resin yield would be ca. 165,000 metric tons.

286. Osier-Growing

See also No. 292.

573. STOTT, K. G. **A review of the British basket-Willow-growing industry.** *Extr.* from *Rep. Agric. Hort. Res. Sta. Univ. Bristol 1959*, 1960 (155–66). 11 refs.

The history of this industry is reviewed in relation to the economic depression of 1958 and 1959. The areas devoted to Willows in Britain are described and the main area, Somerset, is considered in detail. Changes in acreage, recent plantings and grubbings are recorded and the age-class distribution of the main varieties is given. The growing importance of the variety *Salix triandra* 'Black Maul' is shown. Information on prices and demand at the Somerset auctions is presented as evidence of the present economic depression, the main causes of which are discussed, including the effect of imports of Willows and basket ware. Recent improvements in the organization of the Willow-growing industry are described. *From author's summary.*

287. Bamboo and Cane Growing etc.

See No. 367.

574. MAUDOUX, E., and ABEELS, P. **Bamboo cultivation in Belgian Congo central basin.** [*Document*] *2nd Session Inter-African Forestry Conference, Pointe Noire 1958*, 1958. pp. 18. 20 refs. Limited distribution.

Describes silviculture, increment and management of *Bambusa vulgaris*, which has become acclimatized throughout the Congo Basin.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

30. Work Science (Work Studies): General

575. NIPKOW, P. **A second report to the Government of Turkey on logging and forest road construction.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1233, 1960. pp. 14.

[Cf. *F.A.* 21 No. 3193.] Mainly a repetition of recommendations made in the first report.

302. Man and Work (Physiology and Psychology)

See also No. 587.

576. STREEF, G. M., GERRITSEN, A. G., and BOL, M. M. G. R. Arbeidsfysiologische onderzoek bij vellingswerk in de bosbouw. **[Physiological studies on felling and subsequent primary conversion.]** *Repr.* from *Meded. LandbHogesch. Wageningen* 59 (14), 1959 (1–39). 14 refs. [Du.du.e.]

Measurements were made on pulse rate and expenditure of energy by various workers in felling, trimming and barking Japanese Larch and Scots Pine. Results are tabulated. For the Larch, trimming and barking were done with a heavy barking spud (weight 2600 g.) and for the Pine half the workers used this spud, and the others an axe for trimming and an ordinary spud (1200–1500 g.) for barking. A comparison of the two methods for Pine showed that pulse rates and working times were somewhat lower with the heavy spud, although differences were not statistically significant. Work on Scots Pine seemed to be slightly more strenuous than that on Larch of the same diameter. There was no indication of increasing fatigue in the latter part of the day. Differences in pulse rates for work on trees of larger and smaller diameter were slight and can be ignored. Pauses for rest of 5–6 min. considerably reduced the pulse rate, but this was not much further reduced by longer pauses up to about 15 min.

577. KAMINSKY, G. Tagespulskurven im Fichtenhauungsbetrieb am Steilhang und in der Ebene. **[Daily pulse frequency curves in the logging of Spruce on steep slopes and level ground.]** *Repr.* from *Zentralblatt für Arbeitswissenschaft und soziale Betriebspraxis, Frechen* 13 (6), 1959 (81–5). [G.]

Presents measurements taken chiefly on one person in connexion with studies at Gmunden [cf. *F.A.* 20 No. 3237]. Frequencies > 120/min. were measured for > 50% of the working time on the slope, vs. < 1% on level ground. Proposals are made on rest periods.

304. Hygiene; Accidents and their Prevention

See also Nos. 419, 428, 640.

578. **Report of the 4th Session of the study group on vocational training and prevention of accidents in forest work.** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech., Geneva 1960* No. *FAO/ECE/LOG* 69, 1960. pp. 4 + 7 + 9. Limited distribution.

Includes a draft outline for an international handbook of good forest practice relating to occupational safety.

579. BEZOLD, K., *et al.* Röntgendiagnostische Untersuchungen an Waldarbeitern zur Feststellung von Abnutzungsschäden. **[X-ray investigations on forest workers to determine damage caused by heavy work.]** *Forstarchiv* 31 (8), 1960 (121–6). 8 refs. [G.g.]

Of 116 forestry workers examined by X-ray, most of whom had done heavy work for > 20 years, 85 showed moderate or serious morphological changes in the lumbar vertebrae. No correlation was found, however, between these changes and back troubles, which depended principally on age and on number of years of heavy work. Thus no conclusion on reduction in efficiency can be drawn from the degree

of morphological change without reference to the functional condition of the worker. [Cf. *F.A.* 19 No. 4228.]

580. KIRKBY, W. W., and BLASDALE, P. **The eradication of *Glossina morsitans submorsitans* Newst. and *Glossina tachinoides* Westw. in part of a river flood plain in Northern Nigeria by chemical means. Part II.** *Bull. ent. Res.* 51 (2), 1960 (253–64). 5 refs.

[Cf. *F.A.* 19 No. 4231.] Describes operations in 1957 on the flood-plain of the river Komadugu Gana, north of Akwiam, in the Sudan savanna zone. Both species of tsetse were effectively eradicated by a single application of 5% DDT by knapsack sprayer in places of dry-season concentration and on principal mid-day resting sites, viz., between ground level and a height of 5 ft. on tree stems > 6 in. in diam. Cost of treating an area of 55 sq. miles, of which 48 sq. miles remained free of fly during the following dry season, was £98 per sq. mile. A note is appended on the persistence of DDT on bark under field conditions.

581. DAVIES, H., and BLASDALE, P. **The eradication of *Glossina morsitans submorsitans* Newst. and *Glossina tachinoides* Westw. in part of a river flood plain in Northern Nigeria by chemical means. Part III.** *Bull. ent. Res.* 51 (2), 1960 (265–70). 3 refs.

Describes an extension northwards in the dry season of 1958 of work done in 1956–57 [see preceding abstract]. A further 69 sq. miles were treated, a 3·75% aqueous suspension of DDT proving sufficient for eradication. No tsetse had been found in this area 18 months later.

305. Sequence of Work and Performance (Time and Performance Tables, Evaluation of Work)

See No. 517.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 349, 402–5, 464, 478, 482–3, 503, 561–2, 900.

582. **Equipment section.** *Unasylva* 14 (2), 1960 (89–91).

Includes photographs, specifications and descriptions of: Napco Crab Tractor (Napco Industries, Inc., Minneapolis) [moves forwards, backwards, or obliquely]; 150 Log Arch (John Deere Intercontinental S.A., Moline, Ill.) [mounted directly on a tractor; specially designed for selective logging]; International Drott B-20K-3 (International Harvester Co. of Great Britain, London) [crawler-tractor-shovel; control lever changes from normal shovel operation into bulldozer]; Fleco Chopper Model 55-7 (Fleco International Inc., Nassau, Bahamas) [single-drum, straight-blade, rolling chopper for eradicating undesirable vegetation]; brush cutter (Gard Père et Fils, Potelières par St.-Ambroix, Gard) [fits any tractor with power take-off]; Vermeer Pow-R Stump Cutter (Henry R. Jahn & Son Inc., New York City) [cf. *F.A.* 19 Nos. 3056–7]; Ackley Air Saw (Weed Control Service Inc., Portland, Ore.) [designed for pruning, thinning, and brush-cutting; various circular and chain saws can be mounted on a bar, 9 in. in diam., which can reach 20 ft. above ground with a 6-ft. extension; heaviest unit weights 7½ lb.; powered by a high-torque air motor located next to blade].

308. Planning (Organization) of Work

583. PLATZER, H. B. Der Waldfacharbeiter und die Kostensenkung durch vorbildliche Gestaltung der Forstarbeit. **[The skilled forest worker and lowering costs by optimum arrangement of forest work.]** *Forst- u. Holzw.* 15 (14), 1960 (272–5). [G.]

A general discussion.

31. Logging and Transport: General

See also No. 1229.

584. BOJKO, A. P. Organizacija lesozagotovok v bukovyh lesah Karpat. **[Logging organization in [Soviet] Carpathian Beech forests.]** *Lesn. Prom.* 1960 (8), (17–8). [Russ.]

Distinguishes two types of felling area in these forests: (1) those oriented up the slope, i.e. perpendicular to the foot of the hill, and (2) those oriented across the slope, i.e. parallel to the foot of the hill. Skidding procedures in both types are discussed. Skidding from stump to the main skyline installation is not yet mechanized, but it is hoped that mobile winches and small overhead lines will soon become available.

32. Felling and Related Operations

See also No. 588.

322. Felling Season. Preparatory Measures

See also Nos. 548, 637, 1142.

585. KOBYLIŃSKI, F. Wpływ letniego korowania drzew stojących na fizyczne i mechaniczne własności drewna świerkowego. **[Effect of summer barking ol standing Spruce on the physical and mechanicaf properties of the wood.]** *Sylwan* 104 (5), 1960 (83–92). 10 refs. [Pol.]

Trials were made to determine the effect, if any, of tanbark harvesting on wood properties. Full, tabulated, statistically analysed data are presented on the wood properties of Spruce (*a*) felled and completely barked in July and left on the site until Nov., and (*b*) barked to a height of 6 m. in July and felled in Nov. It is concluded that neither treatment impaired wood quality in comparison with that of unbarked control trees felled in Nov.

323. Felling and Subsequent Primary Conversion

See Nos. 345, 576–7, 585, 587, 590 *et seq.*

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood. Salvage Fellings

See also Nos. 345, 621, 1165, 1167, 1197.

586. JECKELN, G. R. A. El desbosque mecánico. **[Forest clearance by mechanical means.]** *Idia* No. 148, 1960 (1–24). [Span.] C.G.B.

Since 85% of the land in Misiones bears forest of a subtropical type, the problem of land clearance

is of vital importance. Fairly detailed reports are presented on methods and equipment used for this purpose in Georgia, U.S.A., where conditions resemble those of Misiones, and in Brazil by the Empresa de Mecanização Agricola S.A., and some of the work accomplished by them. Shorter accounts are also given of equipment used in Chile, Peru and Montana, U.S.A., with notes on equipment acquired in Misiones and costs of operations.

34. Storage of Wood in the Forest and at Log Dumps ('Landings')

See Nos. 637, 1130–1, 1134.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

See also Nos. 517, 576–7, 590, 592, 601, 603–4, 615–7.

587. LUND, H., and SCHIPPEL, H. R. Arbetsmetodikens betydelse vid huggning av massaved i 3-meter-längder. [**The importance of working method in felling and preparing pulpwood in 3-m. lengths**]. *VSA-Redog. Fören. Värmlands Skogsarbetsstud.* No. 26, 1960. pp. 17 + 13 dgms. & gphs. [Sw.]

A study on the expenditure of time by experienced fellers before and after training in a method of rationalization (with diagrams illustrating the order of performance of the various operations, e.g. felling, cross-cutting, trimming and barking) showed a mean total reduction of 14%. Physiological studies showed that pulse rates were 25–30% higher with the new method, and it is emphasized that, especially with older, experienced workers, increased fatigue may counterbalance the theoretical saving of time.

588. SUNDBERG, U. Studier över manuell hantering av rundvirke. [A [**work**] **study on the manual handling of round timber.**] *Medd. SkogsforsknInst., Stockh.* 49 (2), 1960. pp. 120 + 2 dgms., 24 gphs. 22 refs. [Sw.sw.e.*e.*]

Describes time and energy consumption studies on (1) dragging, (2) close stacking with logs parallel, (3) stacking in single tiers of logs separated by two logs laid crosswise, (4) rolling, and (5) sorting in water, of Spruce logs varying from 1 to 7 m. in length, 1 to 12 in. in top diam, and of 0·5–0·6 sp.gr. for seasoned, barked logs and 0·75–0·9 for green, unbarked ones. Productivity and efficiency largely depended on log weight, the optimum for (1)–(3) lying between 30 and 100 kg. according to operation and circumstances, and being slightly higher for longer logs. For (4) and (5) the optimum lay with or above the heaviest logs under study (250 kg.). The advantages, from the handling point of view, of converting to long logs rather than to short pieces, are stressed, even if this means a lower utilization %.

589. HOFSTEDT, B. Upptagning av stickvägnät. [**Opening up spur roads.**] *VSA-Redog. Fören. Värmlands Skogsarbetsstud.* No. 36, 1960. pp. 4. [Sw.sw.]

Presents results of a preliminary study, of one man's work for one day, on clearing undergrowth from a total of 1644 m. for spur roads and, where necessary, cutting back the branches of adjoining trees; the figures show comparative times taken and costs for 3 classes of density of undergrowth to be cleared.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 517, 582, 1041.

590. LUND, H. Barkning med transportabel Cambio barkningsmaskin 35 T på flottledsavlägg och mindre avlägg efter bilväg. [**Barking by the Cambio 35 T mobile barking machine at a log dump by the floating channel or at smaller dumps along the lorry road.**] *VSA-Redog. Fören. Värmlands Skogsarbetsstud.* No. 12, 1959. pp. 22 + 6 photos. [Sw.sw.]

[Cf. *F.A.* 20 No. 567.] Little difference was found between barking time at the large and small dumps. Barking time per cu. ft. decreased with increasing mean log volume up to 3·5 cu. ft.; greater volumes caused a sharp increase in the time spent in handling the logs. Barking time per cu. ft. decreased with increasing log length up to 16 ft. and remained fairly constant at 17–21 ft. Optimum stack height lies between 50 and 70 cm., and optimum length is about 20 m. Careful stacking is essential for efficient working.

591. PETTERSSON, P. E. H., and JOHANSSON, E. Kostnadsjämförelse mellan Cambio T 35 och CHEJ III barkmaskiner. [**Comparison of costs with the Cambio T 35 and CHEJ III barkers.**] *VSA-Redog. Fören. Värmlands Skogsarbetsstud.* No. 31, 1960. pp. 6. [Sw.sw.]

Comparative data are given on fixed, operating, and labour costs in Kr. per unit of time and, from these, costs per cu.m. are calculated. Those for the Cambio T35 range, with increasing number of pulpwood bolts per cu.m., from Kr. 2·25 to 4·51 and those for the CHEJ III from Kr. 2·09 to 5·24. The cost ratio CHEJ/Cambio increases steadily from 0·93 at 10 bolts to 1·16 at 25 bolts/cu.m.

592. JOHANSSON, E. Barkning med transportabel CHEJ-maskin. [**Barking with a mobile CHEJ-machine.**] *VSA-Redog. Fören. Värmlands Skogsarbetsstud.* No. 28, 1960. pp. 9 + 1. [Sw.sw.]

[Cf. *F.A.* 20 No. 568.] The study, on 3-m. pulpwood, was too small in scale for any very definite conclusions to be drawn. Ca. 1500 bolts could be barked in an 8-hr. shift. Better speed was achieved when logs were brought to the machine by a tractor fitted with a grab loader than when the machine was moved from stack to stack and the logs moved by hand. Recommended crew size is 1 tractor driver plus 2 men to feed logs into and out of the barker.

593. GRAMMEL, R., OTT, J., and STEINLIN, H. Durchführung und Ergebnisse der Versuche mit der Entrindungsmaschine Römer. [**Tests with the Römer barking machine.**] *Allg. Forst- u. Jagdztg.* 131 (7), 1960 (145–53). 9 refs. [G.g.e.]

[Cf. *F.A.* 21 No. 1865.] Describes performance tests at different seasons and under 10 stand conditions in Baden-Württemberg. With this power-assisted tool the bark was removed in 6 strips,

during which each log had to be turned twice. Work was faster than with manual barking irons, particularly for the 20- to 40-cm. diameter range. For Spruce and Silver Fir not in sap, but not frozen, up to one-half of the working time could be saved. The work was, however, strenuous, particularly on old Silver Fir, near the butt swellings, and in the crown portions, for which stationary cordwood barkers would have been better. The tool was unsuitable for use on steep slopes and in severe frost. Its present cost is DM.1000, but better and cheaper models are likely to appear soon.

594. PATALAS, Z. O piłach sierpowych z perspektywy pracy jednego roku. [**Sickle-saws viewed after one year's work.**] *Las Polski* 34 (13/14), 1960 (31–2). [Pol.]

Describes and illustrates a sickle-cum-saw having only three teeth, one at the tip of the blade and two close to the handle. This one-man saw weighs only 400 g., and is suitable for use in felling, cleaning and pruning. Scots Pine 14, 16 and 18 cm. in diam., can be sawn in 34, 42 and 98 sec. respectively; Norway Spruce 15, 17, 19 and 21 cm. in diam. in 47, 90, 186 and 195 sec. respectively. Advantages and working techniques are described.

595. **Provisional protocol for the testing of power saws.** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech.* No. *FAO/ECE/LOG*/30 *Rev.* 1, 1960. pp. 11 + 3 + 1 dgm.

[Cf. *F.A.* 20 No. 4642.] A revised version.

596. POLIŠČUK, A. P., and DUBININ, G. N. Povyšenie stojkosti pil'nyh cepej. [**Improving the [wear] resistance of saw chains.**] *Lesn. Prom.* 1960 (8), (8). [Russ.]

Tabulates brief data on the improvement brought about by applying Cr carbides ($Cr_{23}C_6$ and Cr_7C_3) to the cutting parts. A chrome layer 0·01 mm. thick almost trebled the working life of the chain.

597. CERCHEZ, G. Folosirea cepuitoarelor mecanice în exploătirile forestiere. [**The use of mechanical trimming saws in logging operations.**] *Rev. Pădurilor* 75 (2), 1960 (96–7). 4 refs. [Rum. russ.g.f.e.]

Describes in detail (with specifications) 4 models of the Russian RES electric, and RUID petrol-driven, trimming saws. Specifications are given also for the SEVER, Rojanski, U/M and RBS-50.

598. PEČENKIN, V. E., and GUR'JANOV, M. JA. Na puti k sozdanija stacionarnogo sučkoreznogo stanka. [**Development of a stationary branch-cutter.**] *Lesn. Prom.* 1960 (7), (9–10 + 2 sets of dgms.). [Russ.]

Describes, with engineering drawings, a stationary machine with a rotary cutting head for trimming off the branches from trees skidded to timber depots.

599. **Stump gobbler.** *For. Prod. J.* 10 (6), 1960 (9*A*).

Illustrates and briefly describes a tractor attachment (Myers-Sherman Co., Streator, Ill.) driven from the take-off shaft at 533 rev./min. and having 16 special saw blades. It is capable of comminuting a stump in a few minutes.

600. GYSEL, L. W. **An aid for climbing with a rope and saddle.** *J. For.* 58 (7), 1960 (517).

Describes the use of a bow fitted with a fishing reel and line, with a weighted arrow fastened to the line in the same manner as a fishing arrow. With a little practice it is possible to put the arrow and line over a selected limb 60–70 ft. from the ground, and so to get the climbing rope over.

372/377. Land Transport

See also Nos. 70, 582, 584, 588, 858–9, 930, 1297.

601. HOFSTEDT, B. Forsök med buntning av klenvirke. [**Bundling small wood.**] *VSA-Redog. Fören. Värmlands Skogsarbetsstud.* No. 33, 1960. pp. 10. [Sw.sw.]

A preliminary study showed that (1) the need to keep bundles small for manual handling increased the cost of bundle fastenings; (2) the use of two fastenings per bundle increased the speed of loading and unloading; and (3) the saving of cost represented by the difference between the reduction in the driver's time and the increase in the feller's time was counterbalanced by the cost of the fastenings.

602. MAKKONEN, O. Polttohakerankojen metsäkuljetuksesta lumettomana aikana. [**Forest haulage of small-sized long logs for fuel chips during the snowless period.**] *Tied., Metsäteho, Helsinki* No. 171, 1960. pp. 5. [Fi.e.*e.*]

In trials in early summer 1959, 82 solid cu.m. of long logs (mean length 4·6 m., mean diam. at mid-point 6·6 cm., and mean volume 0·016 solid cu.m.) and 81 solid cu.m. of 8- and 6½-ft. pitprops and 2-m. fuelwood were hauled to the roadside, mean distance 200 m., on the VAPO-Ahlgren drag-cart [see *F.A.* 21 No. 4467]. This cart has a releasable bunk which tilts to the rear and can be used to haul long logs, supporting one end of the log only, or, if an extra bunk is fitted to the shafts, for cordwood. The long logs were stacked for hauling on a log supported on two vertical posts, so that the butt ends of the logs were raised above the level of the drag-cart. This was backed under the butt ends and the supporting log was cut away so that the stack dropped on to the drag-cart and could be fastened in position. At the roadside, the tilting bunk was released, the load tilted backwards and the vehicle moved out from under the load. For various reasons, in some of the loads, logs had to be loaded and unloaded individually by hand. The pitprops and fuelwood logs were loaded and unloaded individually. Results for two hauliers are tabulated. Hauling long logs took them 14 and 15% less time than hauling pitprops and fuelwood. Mean hauling time for stacks of long logs handled together, without individual handling, was 14·81 and 16·8 min., and for logs handled individually 27·22 and 28·73 min. Final conclusions can only be drawn after information has been obtained on the time needed to stack the logs in the type of stack described. *From author's summary.*

603. HAKKARAINEN, A. E., and WÄRE, I. Kuormausalustan käyttö pinotavaran autokuljetuksessa. **[The use of a loading frame in the lorry transport of cordwood.]** *Tied., Metsäteho, Helsinki* No. 176, 1960. pp. 16 + 5 photos. 2 refs. [Fi.e.*e.*]

The pre-loading method described is an application of the pallet and interchangeable platform methods. Cordwood is stacked so as to be slightly raised from the ground, and divided into loading lots according to the length of the frame. An empty lorry furnished with a loading frame [illustrated] backs to the stack, drops the frame to the ground and backs it under the stack. The rear support of the frame is then fastened and the loaded frame is pulled on to the lorry by a tipping device and a hydraulic winch. Time studies were made on loading 55 loads and unloading 40, for a driver with or without a helper, and time and costs were compared with those for lorries having fixed platforms, with or without trailer, loaded manually. Costs per trip for a hauling distance of 20 km. were 26% and for 100 km. 13% lower, and daily amounts hauled respectively 50 and 7% higher than for manual loading on to a lorry without trailer. Except for distances < 30 km., costs for a lorry without trailer but having a frame appeared to be greater than for a manually loaded lorry with semi-trailer and fixed platform. The loading frame can also be used conveniently for loading and unloading bundles. *From authors' summary.*

604. PUTKISTO, K. Pukkinosturi pinotavaran kuormauksessa rautatievaunuihin. **[Gantry crane for loading cordwood into railway waggons.]** *Metsät. Aikak.* 1960 (4; 5), (141 . . . 153; 179–84). 8 refs. [Fi.e.*e.*]

In a work study 1102·4 cu.m. of 2-m. Spruce pulpwood (*a*) and 337·9 cu.m. of split Birch fuelwood (*b*) were loaded by a crew of 3 (crane operator, lorry driver, and helper). Results, showing the structure of the working time, are tabulated and include the following: (1) the average working-site time per lorry load—21·2 cu.m. for (*a*) and 19·9 cu.m. for (*b*)—was 22·20 min. for handling (*a*) and 49·27 min. for (*b*); (2) productive working time was only 60% of the total, most of the interruptions consisting of waiting periods; (3) the working-site time of the team was 1·05 and 2·48 min./cu.m. for (*a*) and (*b*) respectively, and the labour time in man-minutes per cu.m., 3·27 and 7·80, whereas the corresponding machine time was 0·24 min. for both assortments; (4) the productive working time spent on moving the railway waggons was 4·09 and 4·24 man-minutes per lorry load for (*a*) and (*b*) respectively; (5) bundle times were 25·72 and 50 man-minutes productive working time per truck load for (*a*) and (*b*) respectively, tying sling ropes round the bundles accounting for 36·6% and arranging the logs on the waggons for 36·5% of the productive time. Rent charged by the State Railways for use of the crane by the carrier is Marks 10 per stacked cu.m. and the theoretical saving in wages, taking this into account, is Marks 12–14 per stacked cu.m. There is no direct economic benefit to the railways but there are indirect savings, e.g. quicker turn-round of waggons.

605. **I. Tractor-mounted loading boom. II. The pulpwood 'Big Stick' loader.** *For. Equipm. Note, FAO* No. *C*.30.60, 1960. pp. 2.

(I) Crawler-tractor equipment tried in New Hampshire. (II) Consists essentially of a frame, winch and non-powered boom, mounted on the frame of a pulpwood lorry. It can skid wood within a radius of 250 ft. and load it on to a lorry.

606. AJZENBERG, A. I., and VOLOBUEV, G. P. Torcovye grejfery na nižnih skladah. **[Grabs that hold logs by their ends—in work at industrial log depots.]** *Lesn. Prom.* 1960 (8), (11–2). [Russ.]

An account of trials with the grab [see *F.A.* 20 No. 4653], mass production of which is now officially recommended.

607. LUND, H. Rapport från transport konferens hos Hiab i Hudiksvall den 3 och 4 december samt från studiebesök på Bergslagets drivning med sulkylunning den 5 dec. 1959 och 17–18 mars 1960. **[Report on a transport conference under the auspices of Hiab, Hudiksvall, 3–4 Dec., and a visit to study Bergslaget's extraction with sulky skidding 3 Dec. 1959 and 17–18 March 1960.]** *VSA-Redog. Fören. Värmlands Skogsarbetsstud.* No. 25, 1960. pp. 15 + 1. [Sw.]

Reports discussion on Hiab loading equipment and on rationalization in loading, and trials by Bergslaget on whole-tree logging.

608. SCHIPPEL, H. R. Lunning med Isachsens traktormonterade vinsch. **[Skidding with the Isachsen tractor-mounted winch.]** *VSA-Redog. Fören. Värmlands Skogsarbetsstud.* No. 23, 1960. pp. 32 + [2] + 7 gphs., 2 dgms. [Sw.sw.]

[Cf. *F.A.* 21 No. 3224.] Presents a detailed analysis of the results of time studies in which the winch was used in clear felling and thinning. They showed that the winch is very suitable for use in clear felling on difficult sites, and may be of use in thinning.

609. LEPENCOV, P. A. O parametrah lebedok trelevočnyh traktorov. **[The parameters of winches on skidding tractors.]** *Lesn. Prom.* 1960 (8), (5–7). [Russ.]

Discusses, and makes recommendations on, the number of drums, pull, speed of cable winding and unwinding, cable-capacity of the drum, and the control systems of tractor winches used for skidding whole trees and for loading large bundles. The tractors mainly considered are the KT-12, TDT-40 and TDT-60.

610. PETROVIĆ, L. Motorno vitlo MV 800 za privlačenje drveta. **[The MV 800 motor winch for timber extraction.]** *Šumarstvo* 13 (1/2), 1960 (101–3). [Serb.]

An illustrated description of the MV 800, a light self-propelling motor winch with a 200 c.c. 'Rotax' engine developing 8 h.p., constructed by the 'Žičnica' enterprise at Ljubljana, weight 200 kg., cost 350,000–400,000 Din. The winch, the first to be made for timber extraction in Jugoslavia, is equipped for distances up to 300 m., but is most effective at 70–100 m.

611. DZIUBAK, W., STAJNIAK, J., and STARCZEWSKI, S. **Report on the testing of light mountain winch driven by the single axle tractor 'DZIK' in accordance with the Protocol for the Testing of Winches.** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech.* No. *FAO/ECE/LOG* 71, 1960. pp. 1 + 13. [Cf. *F.A.* 20 No. 4661.]

612. KANZAKI, K., and SASAKI, I. **[A study on the locus of running load of aerial cableway stretched at one end by a counter-weight.]** *J. Jap. For. Soc.* 40 (2), 1958 (53–7). [Jap.jap.e.*e.*]

Presents results, in graphs and tables, of experiments made with a model cableway, details being given of the linear relationships between the incline of cables and vertical distances, and between weights of load and vertical distances.

613. IRIE, T. **[A study on the vibration of aerial cableway under the action of a moving load.]** *J. Jap. For. Soc.* 40 (4), 1958 (146–53). 8 refs. [Jap.jap.e.]

[Cf. *F.A.* 19 No. 508.] Presents the results of a theoretical examination of the problem of vibration of an aerial cableway and the dynamic change of tension of a cable under the action of a moving load.

614. SKOBEJ, V. V. Trelevočnaja ustanovka s nesuščim kanatom peremennoj dliny. **[Skidding lay-out with a slacking skyline.]** *Lesn. Prom.* 1960 (8), (15–6). [Russ.]

Describes the lay-out of a single-span, aerial cableway used in the mountains of the Irkutsk region of E. Siberia for skidding tree-length logs and whole trees down slopes of 28–30° for distances up to 600 m. Output per [8-hr.] shift is 60 cu.m. in Pine stands of mean stem volume 0·5–0·75 cu.m., and a stocking of 120–160 cu.m./ha.

615. LUND, H., JOHANSSON, E., and JANSSON, G. Studie över brosslingsarbete. **[Study on the work of moving timber manually [from stump to spur road].]** *VSA–Redog. Fören. Värmlands Skogsarbetsstud.* No. 21, 1960. pp. 14 + 1 + 10 gphs., 1 dgm. [Sw.sw.]

Studies were made of the work done by two experienced fellers in moving wood manually from the stump to the spur road and putting it in place there; assortments involved were unbarked timber and partly or completely barked 3- and 4-m. pulpwood. Fellers were instructed, for purposes of comparison, to fell towards the spur road, in such a way that trees close to it fell with their midpoint on it, and those directly beside it lay parallel to it. This 'directional' felling considerably reduced the distance logs were moved, to a mean of 5·25 m. with spur roads spaced 30 m. apart. Time per piece of wood increased with increasing mean volume of piece, whereas time per cu. ft. decreased with increasing volume up to 4 cu. ft. and then remained fairly constant. Volume per ha. of trees marked for felling did not affect mean distance if logs were laid in an even, unsorted line along the spur road. If, however, they were sorted into stacks for the different assortments, distance decreased with increasing volume per ha. Physiological measurements showed continuous moving, even of small pieces (< 2 cu. ft.) to be very heavy work; it should therefore be spread throughout the day and not concentrated at e.g. the end of the day.

616. LUND, H. Jämförelse mellan samarbetet huggare-hest och samarbetet huggare-traktor vid direktutkörning på stickväg. **[Comparison of the combinations feller/horse and feller/tractor with direct skidding to the spur road.]** *VSA-Redog. Fören. Värmlands Skogsarbetsstud.* No. 24, 1960. pp. 21 + 2 dgms., 11 gphs. [Sw.sw.]

On easy terrain, where horse and sledge could be taken right to the stump, no advantage was gained if the feller moved logs manually from the stump to the spur road; on more difficult ground this was, however, necessary. When the more expensive special forest tractors were used, manhandling the logs to the spur road was necessary, but with cheaper tractors, with winch attachments, logs could be stacked, 5 or 10 to a stack between the spur roads, and winched to the road. Skidding by horse and sledge was more economic for distances below, and by tractor for those above, 2·5 km. Physiological measurements showed that the drivers' expenditure of energy was 10% (at moments of greater strain 20%) greater for horse than for tractor skidding.

617. ROMANOV, E. S. Normirovanie krupnopaketnoj pogruzki i trelevki lesa traktorami. **[Working out norms for skidding and loading large bundles of timber by tractors.]** *Lesn. Prom.* 1960 (8), (3–5). [Russ.]

Works out norms suitable for the 7-hr. working day (assuming, within the 7 hr., 30 min. for preparatory and finishing-up work, and a 20-min. break) soon to be introduced throughout the Soviet logging industry. The shorter working day will involve no reduction in earnings, and, in the case of some low-paid workers, will actually bring higher wages.

618. YAMAWAKI, S. **On a relation between the coefficient resistance of logging vehicles and the degree of sinking of tyres into the ground.** *J. Jap. For. Soc.* 40 (12), 1958 (515–6). 3 refs. [E.jap.]

Tabulates test results for a 4-wheel logging trailer and a 2-wheel sulky on a variety of forest-road surfaces in Japan.

619. SALMINEN, J. Kokeiluja puutavaran koneellisesta juonnosta lumettomana aikana. **[Experiments on the mechanized skidding of timber during the snowless period.]** *Tied., Metsäteho, Helsinki* No. 172, 1960. pp. 47. [Fi.e.*e.*]

Machines used were: rear-wheel drive 40-h.p. Fordson Major and 45-h.p. Nuffield wheeled tractors; four-wheel-drive 36-h.p. Nordtrak Stier St. 36 wheeled tractor; 27-h.p. Fiat 25 CF and Russian 40-h.p. TDT-40 crawler tractors; four-wheel-drive 35-h.p. Unimog 30 PS and 75-h.p. Willys Jeep CJ-5 jeeps; and a four-wheel-drive 125-h.p. Magirus Deutz lorry. Average load was 1·0–12·8 solid cu.m. for logs and 1·5–5·3 for pulpwood. The speed was 1·19–4·89 km./hour when empty and 0·66–4·39 km. when loaded. Hauling capacity was, for logs, 11·1–66·9 solid cu.m./8 hours, and for pulpwood 26·9–39·1 solid cu.m., varying with skidding distance

in the range 62–1590 m., vehicle, etc. Normal crew size was two men. A table shows time, capacity, and costs for the different vehicles and methods used. Wheeled tractors and one of the jeeps were the most economical in easy conditions; lorries and tracked tractors were more expensive, though the latter may be the most economical in difficult terrain. A comparison showed that in S. Finland machine skidding can compete with horse skidding only in very favourable conditions, in marked stands, on easy terrain, on large areas, and with efficient use of the machines. *From author's summary.*

620. JONSSON, Y. En ny variation på traktordrivningstekniken. [**A new variation in tractor extraction.**] *Skogen* 47 (14), 1960 (272–3). [Sw.]

Discusses trials of an Allis-Chalmers HD 6 G tractor, equipped with a Kewaco grab, on two areas clear-felled by Mo och Domsjö Aktiebolag. Detailed results of the time studies made are not yet available, but performance was good when the wood was carried in the grab and loaded straight on to the lorry, left at the roadside to be carried to the log dump later, or loaded on to sledges which were drawn by tractor to the log dump.

621. Informations sur le matériel. [**Equipment news.**] *Bois For. Trop.* No. 72, 1960 (78–80). [F.]

Describes, with specifications, the Agrip machines (3 tractors and a loader) made at the Atéliers Duprat, Lignières, Cher; and gives detailed instructions for destroying stumps by the use of KNO_3.

622. **The Bushmaster**. *For. Equipm. Note, FAO* No. *B.*26.60, 1960. pp. 2.

Description and specifications of this 4-wheel-drive multi-purpose 100-h.p. diesel tractor.

623. **I. The model 300 Timberskidder. II. The Michigan model 75 timber tractor**. *For. Equipm. Note, FAO* No. *C.*31.60, 1960. pp. 2. [Cf. *F.A.* 20 No. 4673; 21 No. 563.]

624. KOENIG-FACHSENFELD. Maschinelles Stammholzrücken. [**Mechanized skidding.**] *Allg. Forstzeitschr.* 15 (29), 1960 (405–10). [G.]

A popular discussion of basic engineering and mechanical principles, with descriptions of various tractors, logging arches etc., and suggested solutions for German conditions.

625. CROISŒUIL, Y. DE, and LEPITRE, C. Débardage sur pneus. [**Skidding on rubber tyres.**] *Bois For. Trop.* No. 72, 1960 (31–50). 11 refs. [F.e.span.]

Describes the use of a Letourneau 'Electric Arch' (a diesel-electric, 275-h.p., tractor logging-arch with rubber tyres of 73 in. exterior diam. instead of the standard 94½ in.) during 18 months in Gabon. Output during the dry season was 18 metric tons/hour (150 tons/day) on a 3-km. skidding trail or 12 metric tons/hour on a 4-km. trail. The necessary conditions for the use of this type of equipment are: (1) dry soil; (2) use of crawler tractors to pre-bunch the logs; (3) opening of rough trails on which the rubber-tyred tractor can run; (4) moderate gradients. If these conditions are fulfilled great savings in time and costs can be effected, particularly in respect of wear and tear on the lorries used for hauling from the main landing. Available rubber-tyred tractors suitable for such work are reviewed, with specifications and photographs.

626. Für die Praxis: eine Schlepphaube aus Leichtmetall. [**For practical use in the forest: a skidding cap made of light alloy.**] *Wald u. Holz* 41 (11), 1960 (282–4). [G.]

Describes the 'Solo' cold-drawn skidding cap, in the form of a paraboloid bell with a circular mouth 60 cm. in diam. and weighing only 16 kg., developed by the Forstwirtschaftliche Zentralstelle, Solothurn, and soon to be made on a factory scale. It slides easily over rough ground and stumps, avoids damage to the residual stand, and will stand up to rough service, though it should not be used for long on rock or roads.

627. **I. Powered sulky. II. Flat bottomed sledge for extraction on peat**. *For. Equipm. Note, FAO* No. *C.*32.60, 1960. pp. 2.

Two units developed by the Forestry Commission in Britain: (I) is a hand-steered sulky able to propel itself while holding the load (max. ½ ton) clear of the ground; (II), by virtue of its strength, can be hauled over stumps even with a 2-ton load.

628. YAMAWAKI, S. [**On the log-transportation capacity of logging tractor and sulky—with special reference to tractive resistance, fuel consumption rate and vibration of CT-25 crawler-type tractor and sulky, engaged in hauling logs.**] *J. Jap. For. Soc.* 40 (11), 1958 (481–8). 5 refs. [Jap.jap.e.*e.*]

Presents data on the working efficiency of a 3-ton crawler tractor, with logging wheels hitched, operating at full and at no load, on test tracks and gentle forest slopes. Technical specifications of both tractor and logging wheels are tabulated.

629. YAMAWAKI, S. [**On the log-transportation capacity of logging jeep and trailer—with special reference to tractive resistance, fuel consumption rate and vibration.**] *J. Jap. For. Soc.* 40 (10), 1958 (451–7). 1 ref. [Jap.e.*e.*]

Presents data on the working efficiency of rear- and 4-wheel-driven jeeps with 2- or 4-wheel trailers operating on various types of forest road surface and gradient at full and at no load.

630. GORBAČEVSKIJ, V. A. Novye tipy lesovoznyh avtomobil'nyh poezdov. [**New types of lorry-and-trailer units for timber transport.**] *Lesn. Prom.* 1960 (7), (3–6). [Russ.]

Gives specifications of new Soviet models of lorries, and appropriate trailers, with data on performance under various conditions (road type, tyre pressure, etc.).

631. ČIKOV, JA. I., IL'IN, B. A., and PIIR, A. I. O racional'nyh tipah kolesnyh avtopoezdov. [**Rational types of lorry-and-trailer units.**] *Lesn. Prom.* 1960 (7), (6–9). [Russ.]

Compares the performance of 11 different combinations of Soviet lorries and trailers (4 basic types) designed for hauling tree-length logs.

632. ANDERSSON, A. Angående lastbilar och släpvägnar för virkestransport. [**Lorries and trailers for timber transport.**] *VSA-Redog. Fören. Värmlands Skogsarbetsstud.* No. 19, 1959. pp. 17 + 1 gph., 1 dgm., 8 tbls., 4 photos. [Sw.]

Discusses the chief makes of lorry, trailer, and loading equipment used in Sweden and the combinations of equipment used by four organizations.

633. GAEVSKIJ, I. A. Ėkonomičny korotkie rasstojanija. [[**Lorries without trailers can be**] **economic for short hauls.**] *Lesn. Prom.* 1960 (8), (9–10). [Russ.]

In the winter of 1959–60 in the Archangel region, ZIL lorries were each fitted with a load plate at the rear (like those on skidding tractors), and with a loading winch, and were used to transport tree-length logs or whole trees for short distances, i.e. with one end of the logs (or trees) on the load plate, the other end on the ground. Some data are tabulated on mean loads, productivity, etc. compared with the normal method of transport with lorry + trailer. The new method was found to be practicable from mid-Nov. to April, for hauls ⩾ 5 km., and with loads ⩾ 6·5–8 cu.m. Periodic re-levelling of lorry-road surfaces was found to be necessary.

634. HARKNESS, W. D. **Truck performance and minimum road standards.** *Pulp Paper Mag. Can.* 61 (6), 1960 (141–8, 150–1). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1981 (*B*-8-*a*), 1960.)

A detailed exposition of the factors affecting lorry performance in transporting pulpwood, discussing the need for lorry roads and their expected use in pulpwood logging, defining the basic factors affecting the use of lorries (putting a numerical value on each), covering actual lorry performance under normal logging conditions, and establishing road standards for efficient vehicle use.

378. Water Transport

See also Nos. 644, 940, 1133.

635. PUTKISTO, K. Puutavaranippujen siirto voimalaitoksilla Atrosta ja Puntarikoskelta tehtyjen havaintojen perusteella. [**Moving timber bundles at hydro-electric power stations: observations made at Atro and Puntarikoski.**] *Extr.* from *Årsb. Finl. Flottaréfören.* No. 28, 1959 (1960), (33–68). 4 refs. [Fi.e.]

[Cf. *F.A.* 21 No. 566.] The various methods of moving timber past the power dams are discussed. Sluices, in which logs are floated singly, cause heavy water consumption with a corresponding loss to power economy. Where bundles containing 12–15 solid cu.m. are floated, the floatway must be ⩽ 2·2 m. deep at the lowest water occurring during the floating season. Width depends on the method, i.e. whether bundles are towed in strings or booms or floated singly. Minimum floatway width for a string of bundles 2 bundles wide (ca. 14 m.) is probably ca. 25 m., and for this width the floatway should be straight and almost free of current. The floatway for single bundles, if not manned, should be ⩽ 10 m. wide for a depth of 2·2 m.; there should be a current of ⩽ 0·30 m./sec. and the floatway should be boomed to prevent logs from drifting on to the shallows. On the Atro floatway, the time per unit of timber volume was less for bundles towed in strings than for booms of bundled logs. The material was insufficient for a full comparison of the costs of the two methods. *From author's summary.*

636. SOLOVEJČIK, M. M., and DAROVSKIH, I. A. Novye konstrukcii ozernyh plotov. [**New designs for lake rafts.**] *Lesn. Prom.* 1960 (8), (19–22). [Russ.]

Describes (with illustrations) two new raft designs for use on the Kama and Volga and their large reservoirs.

637. TUOVINEN, A. Kuorellisten koivupoltto-rankanippujen uimiskyky. [**The buoyancy of bundles of unbarked Birch fuelwood.**] *Tied., Metsäteho, Helsinki* No. 175, 1960. pp. 21. 5 refs. [Fi.e.*e.*]

Among conclusions from the investigation, which involved a variety of treatments, are the following: (1) Bundles felled and prepared in autumn and stored on ice during the winter, remain buoyant for 3 months (May–July); buoyancy decreases rapidly thereafter, and the bundles sink. (2) Buoyancy of green, undecayed Birch is related to site quality and crown size, although no definite conclusions can be drawn from the small amount of material studied; buoyancy was poorest for densely grown timber from good sites, the shortest period of buoyancy being 1½ months. (3) Buoyancy of fresh Birch improves slightly with increasing log size. (4) Moisture content of fresh Birch is lowest in July–August and fairly low in June and September; these are the most suitable times for felling to ensure buoyancy. (5) Summer felling (felling and leaving to season with crowns intact) should in normal conditions increase the period of buoyancy. (6) Bundles stored for more than a year before floating have high initial buoyancy but soon become waterlogged, the period of buoyancy being only 3 months; this is at least partly due to the severe decay that occurs. The buoyancy of these bundles remains constant, or decreases slightly, with increasing log size.

638. GENDEL', I. Struenapravljajuščie i ruslotesnjajuščie damby. [**Dams to direct the flow and channel the stream.**] *Lesn. Prom.* 1960 (8), (23–4). [Russ.]

Describes, with illustrations, the use of dams to improve a small floating stream. The economics of the business are discussed, and found satisfactory. In the example cited, the dams will pay for themselves in 3–5 years.

639. LOBANOV, JU. V. Gidravličeskie uskoriteli na podače lesa. [**Hydraulic current-makers for moving logs.**] *Lesn. Prom.* 1960 (8), (24–5). [Russ.]

Laboratory tank experiments were carried out (scale 1 : 10) to determine the best positioning of hydraulic current-makers [cf. *F.A.* 20 No. 4693] in floating depots. On this basis several suitable arrangements of current-makers are presented and discussed.

38. Forest Engineering

381. Materials (including Explosives)

See also No. 643.

640. BROOKFIELD, J. D. **Blasting safety in woods operations.** *Pulp Paper Mag. Can.* 61 (6), 1960 (152. . . 156).

A general article, covering transport, storage, preparation and use of explosives.

383. Roads and Bridges

See also Nos. 575, 582, 589, 634.

641. SZÁSZ, T. A legnagyobb szerfakihozatalt biztosító döntési módok és az irányított döntés. **[The traffic capacity of earth haulage roads.]** *Erdész. Kutatás., Budapest* 6 (3), 1959 (1960), (239–93). 49 refs. [Hu.hu.russ.g.e.*russ.g.e.*]

The traffic capacity of earth roads in Hungary is estimated from data based on meteorological observations over a number of years for different regions, and it is recommended that hauling should be permitted only when conditions are favourable (moisture content of 12–18% and bearing capacity $\leq$ 5 kg./sq. cm.).

384. Protective Works

642. SANTOS GALLOS, M. AMARO DOS. Compte-rendu des travaux de correction torrentielles réalisés au Portugal. **[Report on torrent-training works carried out in Portugal.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/60/5-De.* 1960. pp. 10 + 1 dgm. [F.] Limited distribution.

385. Drainage, Irrigation, Sedimentation. Water Supply

See also Nos. 505–6.

643. WALTERS, J., TESSLER, J. P., and SOOS, J. **Drainage of planting sites with dynamite.** *Res. Note Fac. For. Univ. B.C.* No. 25, [1960?]. pp. 4.

Describes the blasting of ditches 3 ft. deep and 6 ft. wide at Haney research forest, British Columbia, in black muck soil over a gley horizon, on sites that had become waterlogged following the cutting down of mature stands of Western Red Cedar and Western Hemlock. First-year growth of 2 + 0 Douglas Fir planted after draining was good. Costs per acre, for 225–300 ft. of ditch, amounted to $35–38.

386. Waterways. Stream Training

See No. 638.

387. Telephonic Communications etc.

644. JUHARI, Y. Radiolaitteiden käyttö uiton ja metsätalouden palveluksessa. **[Use of radio in floating and forestry.]** *Extr.* from *Årsb. Finl. Flottarefören.* No. 28, 1959 (1960), (69–74). [Fi.e.]

Reviews the experience of its use in water transport to transmit instructions to tugs on the move, gained over the last 20 years and describes the equipment used. *From author's summary.*

4. FOREST INJURIES AND PROTECTION

See also Nos. 214–5, 504.

41. General Technique of Forest Protection. Types of Injury

645. **Agricultural chemicals for aerial spraying.** *Agric. Aviation, The Hague* 2 (2), 1960 (55–63). [E.] O.R.E.

Gives an 8-page list of chemicals suitable for aerial spraying of agricultural and forest crops. The list is subdivided for pesticides, fungicides, and herbicides, and gives the brand names, and the % active ingredient or application rate.

646. PERSIDSKY, D. J., and WILDE, S. A. **The effects of biocides on the survival of mycorrhizal fungi.** *J. For.* 58 (7), 1960 (522–4). 10 refs.

[Cf. *F.A.* 17 Nos. 4047–8.] Forest soil harbouring mycorrhizal fungi was treated with a combination of chlordane, thiosan, and allyl alcohol, applied at different rates. In order to determine the effect of these substances on the survival and behaviour of mycorrhizal fungi, the treated soil was used to inoculate mycorrhiza-free prairie soil, which was then sown with *Pinus radiata.* The growth of the resulting crop of seedlings showed that a heavy application of eradicants (30 lb. chlordane, 180 lb. thiosan, and 150 gal. allyl alcohol per acre) completely destroys mycorrhiza-forming organisms. A light application (10 lb., 60 lb. and 50 gal. respectively) permitted the survival of some fungi, but depressed their growth-promoting efficiency by ca. 50%.

647. YATAZAWA, M., PERSIDSKY, D. J., and WILDE, S. A. **Effect of allyl alcohol on micropopulation of prairie soils and growth of tree seedlings.** *Proc. Soil Sci. Soc. Amer.* 24 (4), 1960 (313–6). 2 refs.

[Cf. *F.A.* 17 No. 4048.] The treatment of mycorrhiza-free prairie Carrington silt loams with allyl alcohol (a.a.) at 25–200 gal./acre produced a strong stimulating effect on the growth of *Pinus radiata* seedlings grown from sterilized seed. Microbiological analyses revealed that a.a. caused a nearly instantaneous replacement of the native fungal population by *Trichoderma viride*; its application at > 100 gal./acre considerably decreased the population of bacteria and actinomycetes, while, as indicated by soil and foliar analyses, considerably increasing the availability of nutrients, especially P and K. The pronounced succulent nature of the seedlings suggested the effect of a growth-promoting substance. Some of the seedlings raised in prairie soils treated with a.a. had well developed coralloid mycorrhizae. The origin of the mycorrhiza-forming organisms is uncertain. *From authors' abstract.*

648. WORLEY, D. P., and DALE, M. E. **Recording tree defects in stereo.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 173, 1960. pp. 11.

[Cf. *F.A.* 21 No. 4507.] Describes a technique, using stereo pairs of photographs, for recording

surface defects and changes on standing trees. The stereo method proved slightly less accurate than a field method whereby a diagram is made with the help of binoculars and a sectional measuring pole, but took $\frac{1}{8}$–$\frac{1}{4}$ of the time and allowed for repeated and independent interpretation.

42. Injuries from Inorganic Agencies other than Fire

421. Air Currents

649. NÄNNI, U. W. **Root distortion of young *Pinus patula* trees at Cathedral Peak.** *J. S. Afr. For. Ass.* No. 34, 1960 (13–22). 3 refs. [E.e.afrik.]

Failures among young trees are common, and examination of dead, moribund, and healthy, apparently normal trees showed that the roots were without exception deformed and with little or no bond between the wood of the root crown and the lateral roots that form pockets or tunnels through the main woody tissue. A number of possible causes (rodent damage, expansion and contraction of soils, cold, drought and disease) were examined and discarded. Sampling in compartments of the Cathedral Peak plantations suggested that the main cause of damage is the strong westerly winds that veer and back continually as a result of topography, possibly in combination with root distortion caused in pricking-out in the nursery or with bad planting in the field.

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 144, 228–30, 338, 445, 659, 707.

650. LARSON, M. M. **Frost heaving influences drought-hardiness of Ponderosa Pine seedlings.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 45, 1960. pp.2.

Loosening of roots of 1-year seedlings by frost-heaving in spring 1956 seriously impaired their capacity to survive the severe drought of the following summer. Degree of overhead shade and soil surface conditions influenced both the amount of frost-heaving damage and seedling survival.

651. TOMAŠEVSKI, S. Gubitak na prirastu kod bukve uslijed promrznuća lišća. **[Loss of increment in Beech as a result of freezing of foliage.]** *Šum. List* 84 (3/4), 1960 (65–73). [Croat.croat.e.]

It was calculated from increment cores from 339 trees at Ravna Gora and Vrbovsko that volume increment loss in Beech caused by freezing of the foliage by snow or late frost amounted to 24–29%. This freezing had no effect on increment in the following year.

652. SCHWERDTFEGER, F. Dürreerscheinungen an der Buche. **[Signs of drought damage to Beech.]** *Forst- u. Holzw.* 15 (10), 1960 (195–6). [G.]

Discusses briefly: loss of bark, failure to shed the last season's leaves, attack by *Cryptococcus fagi*, unhealthy patches of bark due to *C. fagi* attack, and dark patches of bark. [Cf. *F.A.* 22 No. 790.]

653. GIACOBBE, A.; CANTIANI, M. Densità forestale e siccità. **[Stand density and drought.]** *Ital. for. mont.* 15 (3), 1960 (119–21). 8 refs. [It.it.f.]

Giacobbe restates his opinion that adequate thinning is effective in preventing or lessening the ill effects of drought in the Mediterranean region, and disputes Cantiani's thesis that drought injury is less in dense young stands of Beech than in thinned stands [cf. *F.A.* 20 No. 4715]. Cantiani in reply explains that his comparison was between dense young stands and residual stands after heavy regeneration fellings.

423. Precipitations

654. RADU, S. Efecte negative ale zăpezii asupra ienupărului de Virginia şi altor specii. **[Injurious effects of snow on *Juniperus virginiana* and other species.]** *Rev. Pădurilor* 75 (3), 1960 (173–6). 6 refs. [Rum.]

Describes injuries caused to exotic conifers, and especially to *J. virginiana* in the arboretum at Simeria, by a heavy snowfall after prolonged frost in Feb. 1958 (3 times the normal fall for the month fell in 3 days). A large number of Junipers (2679) were uprooted, twisted or broken off. *Thuja occidentalis* and *Chamaecyparis lawsoniana* suffered less severely.

424. Soil Conditions; Erosion Effects

See also Nos. 233, 239, 497, 707, 862.

655. ROBBINS, R. G. **Direct effect of the 1855 earthquake on the vegetation of the Orongorongo Valley, Wellington.** *Trans. Roy. Soc. N.Z.* 85 (2), 1958 (205–12). 6 refs. O.R.S.

The great Wellington earthquake of Jan. 1855, resulting in block faulting as much as 9 ft., violently affected the Rimutaka range, causing large slips on the western escarpment of the Orongorongo river valley. There is evidence that thousands of tons of greywacke rock caused sudden and catastrophic damage to forest vegetation. The effect is still clearly seen in the present forest pattern and is traced in some detail, for the Green's Stream flanking valley. *From author's summary.*

656. ROUSSEAU, L. Z. De l'influence du type d'humus sur le développement des plantules de sapin dans les Vosges. **[The influence of humus type on the development of Silver Fir seedlings in the Vosges.]** *Ann. Éc. Eaux For. Nancy* 17 (1), 1960 (13–118). 100 refs. [F.e.g.]

A fuller report, with detailed research data, of a study already reported [see *F.A.* 21 No. 1927], showing that the lack of Fir regeneration on the mull humus types of the Vosges is caused by accumulations of exchangeable Mn, the toxic effect of which is considerably increased during periods of drought.

657. DUCHAUFOUR, P. Notes sur l'origine de la chlorose de certains conifères sur sol calcaire. **[The origin of chlorosis of certain conifers on calcareous soils.]** *Bull. Soc. Bot. France* 107 (1/2), 1960 (8–12). 7 refs. [F.] O.B.D.

Comparisons of the chemical composition of leaves of conifers on acid and calcareous soils and of seedling growth on soils given various fertilizer treatments, and a study of the N regime in conifers in different growth conditions led to the following

conclusions. In addition to the classic chlorosis of plants averse to calcareous soils (linked to a lack of Fe and Mg), there exists another type of chlorosis provoked by excess of soil Ca, and characterized by a deficiency in N, Mg, or both. The symptoms—retarded growth, loss of vitality and, sometimes, yellowing of the needles—are less severe than in the former case, and may appear in many species that, while not strictly calciphobes, prefer an acid soil. Cultivation of a N-fixing legume, or the addition of fresh organic matter to the soil, plus the addition of a soluble Mg salt are recommended as remedial measures.

658. **Soil fertility: glasshouse pot trials.** *Extr.* from *Rep. For. Timb. Bur. Aust. 1958*, 1959 (16).

Pinus radiata, *P. elliottii* and *P. pinaster* were grown in pots of Bherwerree sand from Jervis Bay. Results so far show: first year—gross deficiencies in N and P; second year—ditto N, P and S; third year—ditto N, P, S, and K. In these trials, diameter was shown to be a more sensitive unit of measurement than height, in that diameter measurements indicated developing deficiencies earlier, and corresponded more closely with visual observation. The bright red and purple colours seen in the cold weather on *P. elliottii* plants deficient in N and P are spectacular and suggest that this species might be used in Australia to indicate deficiencies experimentally. Of the 3 species, *P. radiata* was the most seriously affected by S deficiency, and *P. elliottii* was most sensitive to K deficiency. The results indicate that: (1) the use of rock phosphate instead of superphosphate may induce S deficiency, particularly in *P. radiata*; (2) K deficiency must be included as a likely cause of ill health and slow growth, particularly in *P. elliottii*.

659. PAINE, L. A. **Studies in forest pathology. XXII. Nutrient deficiencies and climatic factors causing low volume production and active deterioration in White Spruce.** *Publ. Div. For. Biol. Dep. Agric. Can.* No. 1067, 1960. pp. 29. 31 refs.

Investigations were made on 133 plots in *Picea glauca* plantations in Quebec, on sandy, droughty soils low in nutrients. Radial and volume growth were found to vary with the availability of soil nutrients. Trial applications of K, P, and Mg gave marked improvements in growth rates. Tree volume was found to be closely correlated with P content in both needles and soil. Active deterioration and mortality were correlated with extensive periods of low rainfall. The extent and depth of rooting was an important factor in deterioration, good growth being noted in trees with adequate vertical roots. Deterioration was not related to the temperature, toxicity, or pH of the soil. Other species with lower nutrient requirements and a greater capacity for meeting their water needs (Red Pine, Jack Pine, Scots Pine, Norway Spruce) showed better growth on similar sites.

660. ASHBY, W. C. **Limitation to growth of Basswood from mineral nutrient deficiencies.** *Bot. Gaz.* 121 (1), 1959 (22–8). 17 refs. O.B.D.

Tilia americana seedlings were given nutrient solutions deficient in various essential components over periods of several months, and were studied for variations in growth response and for visual symptoms of deficiency. Controls receiving complete nutrient solutions in sand culture, under conventional greenhouse conditions, made vigorous growth. Deficiencies of N, P, K, Ca and Mg respectively caused a statistically significant lowering of dry weight; visual symptoms were also present. Seedlings presumably lacking in S showed no differences from the controls. Except in Ca-deficient plants, root growth continued longer than shoot elongation. Preliminary experiments with micronutrients showed that lack of Fe caused marked deficiency symptoms, lack of Mg, Zn and B less marked symptoms, and lack of Cu no symptoms.

661. ASHBY, W. C., and MIKA, E. S. **Sulfur deficiency in *Tilia americana*.** *Bot. Gaz.* 121 (1), 1959 (28–31). 14 refs. O.B.D.

In view of the difficulties in demonstrating S deficiency in plants grown in the open [cf. preceding abstract] *T. americana* test seedlings were grown in sand and solution culture in a chamber with a sealed atmosphere. Growth of seedlings receiving nutrient solutions without S was markedly limited. Those with complete nutrient grew vigorously. Visual symptoms of S deficiency included yellowed leaves, early death of the growing point, and a significantly low dry weight. Roots were slightly smaller than in controls, but otherwise showed no deficiency symptoms. Top/root dry-weight ratios were appreciably lower in S-deficient plants, showing the more marked effect of deficiency on the tops. In certain environmental conditions, atmospheric S may be sufficient to make good a lack of S in the soil, for plants with low S requirements. *From authors' summary.*

425. Chemical Influences (Atmospheric)

See also No. 707.

662. GORHAM, E., and GORDON, A. G. **Some effects of smelter pollution northeast of Falconbridge, Ontario.** *Canad. J. Bot.* 38 (3), 1960 (307–12). 6 refs. O.R.S.

A study along a line N.N.E. from the metal smelter at Falconbridge showed that strong sulphate accumulation in the surface soil occurs only within ca. one mile of the chimneys emitting SO_2, while effects on the soil drainage waters are marked for nearly 2 miles, and still clearly evident 10 or more miles away. The number of species present in the flora declines sharply within ca. 4 miles of the smelter, but certain species (e.g. *Pinus strobus*, *Vaccinium myrtilloidès*) disappear at much greater distances. Among the most tolerant species are *Acer rubrum*, *Quercus rubra*, *Sambucus pubens*, and *Polygonum ciliale*. *From authors' summary.*

663. BESTAGNO, G. Defogliazione dello *Schinus molle* L. da salsedine marina. [**Defoliation of *S. molle* by salt spray.**] *Notiz. Malatt. Piante* No. 49/50, 1959 (143–4 + 4 photos). [It.e.] I.M.I.

Trees of this widely planted ornamental species were observed to be defoliated on the Ligurian coast in 1956, 1957, and 1958, and experimental spraying with sea water produced similar effects. It is

recommended that this species should be planted only in situations sheltered from sea winds.

426. Electrical and Cosmic Influences

664. HAUBERG, P. A. Lynnedslag i skov. **[Lightning damage to forests.]** *Dansk Skovforen. Tidsskr.* 45 (6), 1960 (236–46). 16 refs. [Dan.]

A review, discussing briefly experience from different parts of the world and including damage to individual trees and groups, factors affecting damage (e.g. nature of bark, tree height, groundwater), the use of trees as lightning conductors, etc.

43. Forest Fires

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

665. GRAHAM, H. E. **Lightning probability forecast.** *Fire Control Notes* 21 (3), 1960 (69–74). 9 refs.

A comparison of probability forecasts with actual occurrence of lightning for 8 national forest areas in Oregon showed that reliability varied considerably, but that, in general, forecasts based on subjective judgement, and little or not at all on statistical methods, were reasonably dependable. Information on the degree of uncertainty greatly increased the practical usefulness of the forecasts.

666. STEELE, B. **Thermistors for measuring temperature of forest fuels.** *Fire Control Notes* 21 (3), 1960 (83–6).

Describes a glass probe thermistor by which surface temperatures can be measured independently of air temperature and solar radiation. Branches, twigs and chunks of Ponderosa Pine timber exposed to the sun reached temperatures exceeding air temperatures in the shade by as much as 30° F.

667. WENDEL, G. W. **Fuel weights of Pond Pine crowns.** *Res. Note Stheast. For. Exp. Sta.* No. 149, 1960. pp. 2. 1 ref.

Presents two graphs showing a linear relationship of oven-dry weight of foliage, and of foliage plus branchwood, with d.b.h. based on measurements of 20 *Pinus serotina* trees of 2·6–14·8 in. d.b.h. in Hofmann forest, N. Carolina.

668. **Moisture regime of understory vegetation and Slash Pine.** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1959*, 1960 (45–6, 50).

In a one-year study of 4 species in N. Carolina, moisture content was highest in June and July except for *Arundinaria tecta* (May), fluctuations ranging from 90–135% in *Cyrilla racemiflora*, 70–115 in *Ilex glabra*, and 70–105 in *Persea borbonia*, to 60–85 in *A. tecta*, fluctuations in foliage being greater than in the whole plant. In a similar study in Georgia, Slash Pine needles maintained a m.c. consistently above all other material examined, at 175%.

669. OLSEN, J. M. **Cistus, fuel moisture, and flammability.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 159, 1960. pp. 2. 1 ref.

If Cistus is fire-resistant, the reason is probably not high m.c. In monthly tests on *C. purpureus*, m.c. was found to be relatively high in the spring, but in the fire season not markedly greater than that of Chamise (*Adenostoma fasciculatum*).

670. **Fire behaviour.** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1959*, 1960 (39–43).

Mainly a description of the 'Pungo 1959' fire in the low swampy organic-soil area of N. Carolina. Time-lapse camera photos showed that up-draught velocities at the top of the convection column reached 25 m.p.h. Warnings provided by the upper air soundings of the 'winds aloft' monitoring station at New Bern proved very valuable.

671. DAVIS, L. S., and MARTIN, R. E. **Time-temperature relationships of test head fires and backfires.** *Res. Note Stheast. For. Exp. Sta.* No. 148, 1960. pp. 2.

Presents temperature curves taken with chromel/alumel thermocouples in fires in 8-year-old Gallberry-Palmetto roughs in Georgia, with fuel weights of 5–10 tons/ha. and a burning index of 1. At 1 foot from the ground, the head-fire temperatures rose in less than a minute to 1600° F., and then fell off, first sharply, then at a decreasing rate. The slower moving back fires produced temperatures of 250 to 600° and maintained them for several minutes. At 4 ft., the head fires barely exceeded 500° and the back fires 125°.

672. **Fire behaviour in Eucalypt fuels.** *Extr.* from *Rep. For. Timb. Bur. Aust. 1958*, 1959 (19).

A programme of large-scale, free-burning experimental fires was begun in 1957, and some 120 fires have been studied. When the rate of spread for a given moisture content is related to the square of the wind velocity, an inverse relationship exists between the rate of spread and fuel m.c., with a critical fuel m.c. of ca. 4%, at which crown fires develop. The main rate of spread in Eucalypt forests of the dry sclerophyll type, carrying 4–8 tons/acre of fire surface fuel, under the worst possible conditions, will be ca. 1½ miles/hr. In such conditions, long-distance spotting fires might carry 6–7 miles. The rate of advance of a fire burning under relatively mild meteorological conditions roughly doubles for each 4 tons/acre increase in fuel quantity. Under the same conditions flame height also varies proportionately to the fuel quantity. Experimental work to date indicates that fuel quantity and distribution may be much more significant in controlling fire behaviour than are factors connected with considerable variations in meteorological conditions.

432. Prevention and Control

See also No. 1248.

673. **Coloured smoke aids fire location.** *Fire Control Notes* 21 (3), 1960 (86).

Describes the use of brightly coloured smoke flares by forest fire-fighting crews, as aids to look-outs or aerial observers in detecting fires.

674. **Tank installation in T.B.M. air tanker.** *Tech. Equipm. Rep. U.S. For. Serv.* No. 5100–11, 1960. pp. 19. 4 refs.

Describes, with full explanations and 10 sheets of

construction plans, a 600-gal. tank and its equipment developed for use in the TBM-3 'Avenger'. [Cf. *F.A.* 21 No. 607.]

675. FAHNESTOCK, G. R., and JOHANSEN, R. W. **Will [NaCa] borate kill Southern timber?** *Fire Control Notes* 21 (3), 1960 (87–93). 1 ref.

In tests in Louisiana [cf. *F.A.* 20 No. 4729], 1-year Loblolly Pine planted > 1 year after treatment again failed, and mortality in adjacent strips to which the borate had spread was 44%. Height growth of trees was also below normal two years after spraying. In laboratory tests in Georgia, lower applications (3 or 6 gal./100 sq. ft.) completely inhibited germination of seed and caused very high mortality of 1-year-old potted seedlings of Loblolly and Sweetgum. In field tests, aerial application, less toxic to the potted plants than direct borate treatment of soil, caused greater injury. Sweetgum suffered more than Pine, though there was no mortality in either species. Even the lower rate of application caused considerable injury.

676. BELJAEV, I. A. Protivopožarnye polosy na vyrubkah. **[Fire lines on clear-felled areas.]** *Lesn. Prom.* 1960 (7), (15–6). [Russ.]

Discusses briefly the use of trench cutters and root grubbers in constructing fire lines. A line 19–20 m. wide will contain a fire at wind speeds ≯ 5 m./sec.

434. Revegetation etc. of Burnt Areas

See Nos. 67, 494.

435. Benefits of Fire Control. Injurious Effects of Fire

See No. 83.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See Nos. 328, 343.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also Nos. 6, 324, 339–40, 390–1, 437–42, 446, 469, 645–7.

677. MCNAMARA, E. F. **Sprouting capacity of Scrub Oak.** *J. For.* 58 (7), 1960 (563–4).

Experiments in cutting back *Quercus ilicifolia* as a control measure, showed that it must be cut 12 times before sprouting stops.

678. **Hand grubbing 'sure kill' for Mesquite.** *New Mexico Extension News, Albuquerque* [?] 39 (10), 1959 (4–5). From *abstr.* in *Weed Abstr.* 9 (2), 1960 (347). O.W.

The most economical method of controlling *Prosopis* spp., for plants with a crown spread of 30 in. or less, is by severing the roots below the budding zone about 4 in. below the surface of the soil. Chemical control is necessary for larger plants.

679. KLITSCH, F. E. **The advantages of mist blower application of 'Ammate' X for brush control.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (393–7). 2 refs. From *abstr.* in *Weed Abstr.* 9 (5), 1960 (863). O.W.

Describes the use of a knapsack-style mist-blower of 2·5 gal. capacity for spraying brush 3–5ft. high along 90 miles of pipeline inaccessible to power equipment. The spray mixture used was NH_4 sulphamate ('Ammate' X) (360 lb.) plus a spreader-sticker (1 quart), No. 2 fuel oil (5 gal.), and an emulsifying agent (1 pint), made up to 100 gal. with water. Moderate winds or light rainfall did not interfere with the mist application. Coverage of dense or tall clumps required more skill than with the hydraulic method. Spray drift did not exceed that with the hydraulic method. The main species present were *Acer rubrum*, *Alnus* sp., *Quercus* sp., *Carya* sp., *Betula* sp. and *Fraxinus* sp.

680. SMITH, R. N. **Application of 'Dybar' fenuron weed and brush killer to a right-of-way in northern Maine.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (379–82). From *abstr.* in *Weed Abstr.* 9 (5), 1960 (865). O.W.

Describes experiments in summer 1959, comparing the control of brush 8–15 ft. high by (1) scattering pellets of fenuron, and (2) basal stem applications of 2,4,5-T in oil with a knapsack sprayer. Fenuron was cheaper, and easier and cleaner to handle. For brush density of 5000 stems/acre, the area covered per man-day was (1) 1·4 acres and (2) 0·6 acres. With (1), both deciduous trees and conifers are controlled, and the grid method of application is effective. Method (2) requires individual stem treatment and does not control conifers.

681. BOYD, W. I., and POULOS, P. L. **Brush control with spot applications of fenuron in the northeast.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (398–405). From *abstr.* in *Weed Abstr.* 9 (5), 1960 (866). O.W.

The % kill of brush after spot treatments on 11th May 1956 with fenuron (1) 1·13 g. and (2) 3·3 g./cluster was:—7th July, 1957 (1) 39%, (2) 67%; 7th July, 1958 (1) 72%, (2) 96%; 8th September, 1959 (1) 83%, (2) 98%. About 20 species were present. The % present at time of treatment and % of seedling population 4 seasons after treatment were as follows: *Quercus* spp. 60% and 26%; *Betula lutea* 11% and 36%; *Acer* sp. 7% and 2%; *Corylus* sp. 6% and 15%; *Prunus* sp. 3% and 5%; *Populus* sp. 6% and 7%; *Pinus* spp. 6% and 6%; *Amelanchier* sp. 1% and 2%. Only 11% of the regrowth seedlings were more than 2 ft. high. Trees within 5 ft. distance, and some Oak and White Pine 25 ft. distant, from the edge of the treated plot were affected. Treatments in November, March, July, and April showed that the kill depended on the time elapsed and not the time of treatment. Good ground cover was established.

682. TRUMBO, H. A., and CHAPPELL, W. E. **Techniques involved in the use of chemicals for establishing wildlife clearings.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (454–9). From *abstr.* in *Weed Abstr.* 9 (5), 1960 (873). O.W.

[Cf. *F.A.* 21 No. 2705.] Monuron and fenuron were applied in June at 5–10 g./stem (5 g. to stems up to 5 in. d.b.h., 10 g. to larger), NH_4 sulphamate

to complete frills at 7 lb./2 gal. water in August and 2,4,5-T to axe cuts 4 in. apart at 12 lb./100 gal. oil. The % kills obtained after 1 year with the above four compounds were: *Quercus borealis* 97, 90, 90, 2; *Quercus alba* 99, 87, 93, 4; *Q. prinus* 95, 90, 90, 1; *Castanea* sp. 0, 100, 100, 35; *Sassafras* sp. 82, 52, 87, 21; *Cornus* sp. 78, 91, 92, 27; *Robinia pseudoacacia* –, –, 100, 0; *Acer rubrum* 86, 61, 89, 29; *Carya* sp. 84, 76, 82, 3; *Rhus* sp. 100, 100, 63, 7; *Pinus* sp. 100, 99, –, –; *Prunus* sp. –, 100, –, –; *Crataegus* sp. 100, –, –, –; *Amelanchier* sp. 86, 31, 87, 53; *Oxydendrum arboreum* 67, 80, 88, 3; *Hamamelis* sp. 78, 53, 97, 17; *Juniperus virginiana* –, 100, –, –. In another trial on all of the above species except *Rhus* sp., *Crataegus* sp., and Red Cedar, and also including *Liriodendron tulipifera* and *Pyrularia pubera*, fenuron at 1 g./stem gave as good control as 4 g./stem except on *Cornus* sp., *Acer rubrum*, *Carya* sp., *O. arboreum*, and *P. pubera*; only *Cornus* sp. and perhaps *Amelanchier* sp. were less well controlled by 2 g./stem than by 4 g.

683. KREFTING, L. W., HANSEN, H. L., and HUNT, R. W. **Improving the browse supply for deer with aerial applications of 2,4-D.** *Minn. For. Note* No. 95, 1960. pp. 2.

In July 1958, a 2,4-D ethyl ester formulation was applied at 2 lb. acid/acre in 3½ gal. of water to two 2-acre plots in each of 4 cover types: (*a*) Aspen, (*b*) Jack Pine, (*c*) Oak, (*d*) upland brush. Results (tabulated) after 1 year were encouraging. The number of stems of plants in the first preference group for browse increased by 115, 182 and 24% for (*a*), (*b*) and (*d*) respectively. The number of all stems on (*c*) and of low-preference groups on (*d*) decreased markedly. In all cover types, mortality of low-preference browse was greater than that of the first preference group. No mortality of herbaceous plants was noted, and grass and sedge density increased as more light reached the ground. Cost data indicated that areas of ⩽ 100 acres could be sprayed for < $4.00/acre. [Cf. *F.A.* 19 No. 3809.]

684. NOYES, J. H. **Spot treatment of monuron and fenuron to control Ground Juniper.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (450–3). From *abstr.* in *Weed Abstr.* 9 (5), 1960 (864). O.W.

Monuron and fenuron slurries gave better results than fenuron pellets for the control of *Juniperus communis*, when applied in May. It appeared that less than 1 g. per plant may be all that is required for eradication.

685. BYRNES, W. R. **Long-term evaluation of chemical brush control on a power line right-of-way.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (422–9). 7 refs. From *abstr.* in *Weed Abstr.* 9 (5), 1960 (870). O.W.

Six methods were compared: (1) unsprayed control, hand-cut in April 1958, 6 growing seasons after initial clearance; (2) broadcast foliage spray 2,4-D + 2,4,5-T (1:1, as butoxy ethanol esters), 4 lb. acid equivalent/100 gal. applied in June 1953; (3) semi-basal spray 2,4-D + 2,4,5-T (1:1, as acids) 6 lb. a.e. in oil carrier 10 gal./100 gal. spray, applied in June, 1953; (4) general summer basal spray 2,4-D + 2,4,5-T (1:1, as acids) 12 lb. a.e. in oil carrier/100 gal. spray, applied June, 1953; (5) selective winter basal spray 2,4,5-T (butoxy ethanol ester) 12 lb. a.e. in oil carrier/100 gal. spray, applied February, 1954; (6) broadcast spray NH_4 sulphamate 0·75 lb./gal. water + sticker-spreader. By the end of the second season, 94–99% top kill resulted from all chemical treatments. In 1954 the amount of regrowth as % of original number of stems/acre was (2) 21%, (3) 8%, (4) 7%, (5) 5%, (6) 27%. A follow-up basal spray in July 1954 eliminated woody scrub in all areas by 1959. Where 1954 follow-up treatments were omitted, the main species present in the regrowth, in August 1957, were *Sassafras* sp. on (5) and to a lesser extent on (3), *Acer rubrum* on (6), and mixed *Quercus* spp. on (2). Regrowth on (1) in 1957 was 6–15 ft. high, hand cutting 1958 resulted in a dense layer of brush 2–6 ft. tall in 1959.

686. MCCONKEY, T. W. **Helicopter applications of 2,4,5-T show differences in hardwood control.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (466–71). O.W.

A comparison was made of results of helicopter applications of 2,4,5-T (3 lb./acre in 1¾ gal. fuel oil) in two successive years (July 1954 and August 1955) on even-aged, mixed hardwood regrowth originating after fire in 1947. There were marked differences in control of *Acer rubrum*, and some differences in control of Oaks, particularly in extent of coppicing. The differences in time of year, weather, and amounts of summer rainfall may have been contributing factors. Both applications gave satisfactory control for management needs.

687. KIRCH, J. H., WALDRUM, J. E., and BROWN, H. F. **The invert emulsion—a promising tool for right-of-way management.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (413–8). 5 refs. From *abstr.* in *Weed Abstr.* 9 (5), 1960 (862). O.W.

Describes experiments on invert (water-in-oil) emulsions as ground and aerial sprays for brush control. 2,4,5-T with or without 2,4,-D, 6 lb. in oil (15 gal.) plus water (83·5 gal.) sprayed in June to cover ⅘ of the plants from the base upwards, or used as a broadcast spray in November on dormant stems, gave good ground-line kill. Vigorous coppicing from the root-collar zone occurred in the second growing season after spraying. When the exposed root-collar zone was sprayed in June with acid 12 lb. in oil (30 gal.) plus water (67 gal.), 95–100% kill was obtained of Red Maple, Scrub Oak, Red Oak, White Oak, Black Cherry and White Ash. November basal spraying gave 20% less kill. A table shows the results in September 1959, after aerial spraying in June 1958 of brush 15 to 25 ft. high with 2,4,5-T at 6 lb./acre or 2,4,5,-T at 3 lb./acre + 2,4-D at 3 lb./acre in oil (3 gal.) plus water (7 gal.). A brief description is given of a centrifugal sprayer designed for aerial spraying of invert emulsions. Aerial spraying of invert emulsions caused no damage due to drift. Wind velocity was 5 m.p.h. and helicopter speed was 35 m.p.h.

688. DAY, M. W. **Effectiveness of some herbicides in killing young Red Maple.** *Quart. Bull. Mich. Agric. Exp. Sta.* 42 (4), 1960 (854–8). 4 refs.

Various dosages of 6 undiluted herbicides were

applied to > 300 *Acer rubrum* stems, mostly 2–4 in. diam., in 1-in. cuts 1 ft. above the ground. Minimum effective dosages for 2-in. stems (giving ≥ 85% kill) were ½–4 ml. Differences in rate of kill and in effect on adjacent trees were noted. Best results were obtained with the triethylamine salt of 2,4,5-T and with PBA.

689. HAMILTON, L. S. **Successful killing, but no chemi-peeling, using certain amines in frills during early summer.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (446–9). 11 refs. From *abstr.* in *Weed Abstr.* 9 (5), 1960 (867). O.W.

3-amino-1,2,4-triazole (amitrol) 20 lb./100 gal., polychlorobenzoic acid (PBA) dimethylamine 40 lb. acid equivalent/100 gal., MCPA (dimethylamine) 40 lb. a.e./100 gal., 2,4,5-T (triethylamine) 40 lb. a.e./100 gal., and a mixture of equal parts of the last two at 53 lb. a.e./100 gal. were applied in water in June to complete frills of trees ranging from 3 to 6 in. in d.b.h., of *Acer saccharum*, *Fagus* sp., *Tilia americana*, *Betula lutea*, and *B. lenta*. When assessed 3 months later, only MCPA, 2,4,5-T and the mixture had given > 70% top kill; after 15 months 2,4,5-T, with or without 2,4,-D, had given 100% kill, MCPA 96%, PBA 80%, 2,4,-D 50% and amitrol 29%. The Maples were the most resistant spp. What regrowth occurred was weak and was not considered of significance.

690. JEFFERS, W. A. **Late season foliage applications of amino triazole and amino triazole-benzoic combinations on Black Locust.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (383). From *abstr.* in *Weed Abstr.* 9 (5), 1960 (868). O.W.

Over-all sprays of amino-triazole plus 2,3,6-TBA were no more active on *Robinia pseudoacacia* than either compound alone. August applications were much superior to September. Amitrol alone gave promising results on *Fraxinus americana*, *Prunus serotina* and *Rhus typhina*, but not on a number of other species. The mixture was not more effective than amitrol alone.

691. CHAPPELL, W. E., and SAYRE, R. E. **The use of certain combinations of herbicide for brush control.** *Proc. 14th Ntheast. Weed Control Conf.* 1960 (419–21). From *abstr.* in *Weed Abstr.* 9 (5), 1960 (869). O.W.

Almost complete kill, without coppicing, of *Robinia pseudoacacia* 10–15 ft. high resulted from spraying in June with 2,3,6-TBA (amine) plus amitrol. Combinations of amitrol with 2,4-D and 2,4,5-T were less effective. Amitrol had less effect on coppicing in other species.

692. OTTER, F. L. **Timber stand improvement by poisoning Black Oak on Mountain Home State Forest.** *St. For. Note Calif. Div. For.* No. 2, 1960. pp. 4. 4 refs.

In tests on over-storey *Quercus kelloggii* to release conifer saplings in California in 1954–59, horizontal axe cuts made at a 45° angle into the stem were filled with liquid 2,4-D-amine at 4 lb. acid equivalent/gal. In 1954, treatment of ca. 100 trees was uniformly successful when applied to cuts 3–10 in. apart. Partial kills in 1955 where axe-cuts were as close as 3 in. may have been the result of inadequate dosage. In 1958 and 1959, the standard treatment of leaving as much bark between cuts as the width of the cut gave good results and it was concluded that the complete frilling advocated by other workers [see *F.A.* 17 No. 3947] was not necessary. [Cf. *F.A.* 22 No. 694.]

693. LEONARD, O. A. **Repeated application of herbicides to live Oak sprouts essential for complete kills.** *California Agriculture, Berkeley* 14 (1), 1960 (15). From *abstr.* in *Weed Abstr.* 9 (3), 1960 (547). O.W.

2,3,6-TBA and mixtures of polychlorobenzoic acids, at rates up to 32 lb./acre in 100 gal. water failed to kill *Quercus wislizenii* coppice shoots, and amitrol gave poor or (at 8 lb. acre/in 100 gal. water) inconsistent results. 2,4,5-TP at 4 lb./acre gave the best result (70% kill) when applied in June and 2,4-D + 2,4,5-T (esters) at 4 lb./acre gave the best shoot kill (60%) when applied in November if rains fell. 2,4-D (amine) was most successful after applications in November or April, giving kills of 60–70% from 8 lb./acre, 80% from 16 lb./acre and 100% from 32 lb./acre. The addition of 0·5% oil to 2,4-D (amine) enhanced its effect. Repeated applications of herbicides were found to be necessary. 2,4,5-TP was less effective against *Photinia arbutifolia* and *Rhamnus californica* than a mixture of 2,4-D and 2,4,5-T.

694. GIBBS, C. B. **Amines of 2,4-D hold promise for hardwood control.** *Down to Earth, Midland, Mich.* 15 (3), 1959 (6). 5 refs. From *abstr.* in *Weed Abstr.* 9 (4), 1960 (699). O.W.

In preliminary experiments in March, 1957, 2,4-D (amine) at 400 lb./100 gal. was applied in notches 3 in. apart to (*a*) *Quercus stellata* and (*b*) *Liquidambar styraciflua* (0·6–3·5 in. d.b.h.). Dosages of 0·5 ml./notch killed 96% of (*a*), and 81% of (*b*) during 1958; 2 ml./cut top-killed 99% of (*a*) and 100% of (*b*) during 1958. During the second growing season coppicing occurred on 25% of (*b*) stems treated with 0·5 ml. and on 7% of stems treated with 2 ml. None of (*a*) coppiced. The cost of 2,4-D (amine) would be no more than 2,4,5-T (ester) and the smaller volumes used would be more convenient in an injector.

695. CARVELL, K. L. **Comparison of Veon 245 and Esteron 245 for killing cull Oaks.** *Down to Earth, Midland, Mich.* 15 (3), 1959 (14–5). From *abstr.* in *Weed Abstr.* 9 (4), 1960 (698). O.W.

The % kill of *Quercus alba* of 6–20 in. d.b.h., 1 year after June frilling or incising at intervals of 1, 2 or 4 in., plus applications of undiluted 2,4,5-T (triethylamine salt, Veon 245) or 2,4,5-T (propylene glycol butyl ether ester, Esteron 245) in a water carrier showed:—(1) in all diam. classes the % kill was higher for the amine than for the ester formations; (2) increase in distance between the incisions and increase in diam. reduced the % kill, and the reduction was greater for the ester than for the amine formulations; (3) with trees of < 12 in. d.b.h. a complete frill is unnecessary, whereas for trees of 16 in. d.b.h. it is essential.

696. KLUG, H. A., and HANSEN, H. L. **Relative effectiveness of various concentrations of 2,4-D in basal, dormant-season applications to Hazel brush.** *Minn. For. Note* No. 94, 1960. pp. 2. 2 refs.

In Feb. 1959, concentrations of 0·5, 1·0, 1·5, 5, 10, and 15 lb. 2,4-D acid equivalent/100 gal. fuel oil were applied, basally by brush, each to 30 Hazel stems. Effects on the two species present, (*a*) *Corylus cornuta*, and (*b*) *Corylus americana*, differed. Treatments at all concentrations were highly effective on (*a*), causing 76–100% mortality. No significant difference was noted between concentrations > 1·5 lb., but these were significantly more effective than concentrations < 1·5 lb. Mortality of (*b*) was similar for 5–15 lb., but much less than that of (*a*) for 0·5- to 1·5-lb. concentrations. For both species the 5-lb. dosage sufficed for an effective kill.

697. BOUGARD, M. Prix de revient des débroussaillements chimiques au 2,4,5-T. Sont-ils rentables? **[The costs of chemical control of brush by 2,4,5-T. Are they economic?]** *Bull. Soc. For. Belg.* 67 (6), 1960 (229–37). [F.]

Analyses the costs of treating one ha. of brush-covered land, reasonably accessible, and with water available ⩾ 100 m. away, by (*a*) spraying with an ordinary back-pack spray, (*b*) spraying with a back-pack motor atomizer and (*c*) cutting by hand. Taking into account the cost of apparatus and chemicals, as well as wages, and the fact that the effects of treatment with 2,4,5-T last for 3 years or more while (*c*) must be repeated for 3 years to get a comparable effect, it is calculated that costs/ha. are (*a*) Fr.1520, (*b*) Fr.1075, and (*c*) Fr.3750.

698. KIŠPATIĆ, J., and BÖHM, A. Mogućnosti primjene herbicida u šumarstvu. **[The use of herbicides in forestry.]** *Šum. List* 84 (5/6), 1960 (137–51). 7 refs. [Croat.g.]

Describes experiments in control of unwanted species, malformed trees, advance and coppice growth, in various parts of Jugoslavia, by stem applications (over bark) of bands, ⩽ 25–30 cm. wide, of herbicides based on 2,4,5-T (Regulex B-40 at 5–10% concentrations and Tormona 100 at 3%, both in fuel oil). Species successfully controlled included *Quercus sessiliflora*, *Fagus sylvatica*, *Carpinus betulus*, *Populus tremula*, *Salix* sp., *Castanea sativa*, *Ulmus campestre*, *Alnus glutinosa* and *Acer pseudoplatanus*. Chemical control was definitely cheaper than mechanical control. *Prunus spinosa*, *Crataegus* sp., *Amorpha fruticosa*, and *Rubus* sp. were also successfully controlled both by foliage sprays and by application to the bark, of water emulsions of 2,4,5-T. In young *Pinus nigra* plantations and in forest nurseries, weeds were controlled by aminotriazole at 10 and 20 kg./ha. Best control of bracken was obtained by spraying with 10 and 20 kg./ha. of dalapon in water in July.

699. QUINN, L. R., and GRIFFING, J. B. O controle do 'leiteiro' e do 'amendoim' em pastagens. **[Control of *Tabernaemontana fuchsiaefolia* and *Pterogyne nitens* in pastures.]** *Publication, I.B.E.C. Research Institute, New York* 1958. pp. 15. [Port.] From *abstr.* in *Weed Abstr.* 9 (5), 1960 (871). O.W.

Recommends 2,4,5-T (ester) in diesel oil (1:50) applied, preferably after cutting down stumps to 30–40 cm. high, in rainy weather at period of active growth, with a repeat if necessary 6–12 months later. Applications to shrubs should be made on the day of cutting. An area of 15–25 cm. round the base of each shrub should be wetted.

700. **Weed killers [for the control of Eucalypts].** *Extr.* from *Rep. Dep. For. S. Afr. 1957/58*, 1960 (13).

Further experiments were carried out in Zululand on *Eucalyptus maculata* and *E. paniculata* stumps with 2,4-D and 2,4,5-T [cf. *F.A.* 20 Nos. 3318, 4576]. Results indicated that a 1/40 solution of 2,4-D in power paraffin will kill 90% of *E. maculata* stumps, and a 1/30 solution of 2,4,5-T all *E. paniculata* stumps. The main object of these experiments was to obtain a cheap and easy method of killing stumps of thinnings in *E. saligna* experimental plots, and it was found that a 1/20 solution of 2,4-D in power paraffin effectively killed *E. saligna* stumps of ⩽ 7 in. diam., if applied immediately after felling.

442. Parasitic (Higher) Plants. Epiphytes. Climbers

701. ANDREWS, S. R., and DANIELS, J. P. **A survey of dwarfmistletoes in Arizona and New Mexico.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 49, 1960. pp. 17. 7 refs.

It was estimated from a detailed road and sample-plot survey in 1954–57 that out of a total of ca. 8·3 million acres of forest, 2·5 million in (*a*) the Ponderosa Pine type were infected with *Arceuthobium vaginatum*, and 275,000 acres in (*b*) Douglas Fir with *A. douglasii*. Abundance in (*a*) was greatest in virgin stands and on ridges, increasing directly with elevation. Annual mortality losses associated with dwarf mistletoe were estimated at 55–75 million bd. ft. for (*a*) and 20–27 million bd. ft. for (*b*). When compared with (*a*) plots with light intensity of infection, plots with medium intensity had 17% smaller yield and 38% greater mortality. [Cf. *F.A.* 21 No. 3332.]

702. GRAHAM, D. P. **Dwarfmistletoe survey in Kaniksu National Forest.** *Res. Note Intermt. For Range Exp. Sta.* No. 74, 1960. pp. 6. 1 ref.

Estimates of distribution and abundance were made from a roadside survey in 1959. Larch mistletoe was found along 54% of the 300 miles of roadside strip traversed in stands containing ⩾ 10% Western Larch, vs. 6% of 153 miles for Lodgepole Pine. Several infected Douglas-Fir stands were noted.

703. GRAHAM, D. P. **Dwarfmistletoe survey in Nezperce National Forest.** *Res. Note Intermt. For. Range Exp. Sta.* No. 75, 1960. pp. 7.

Survey of a strip along 570 miles of road showed that 54% of the forest contained infected trees. Of > ½ million bd. ft. of merchantable Douglas Fir and Western Larch on 200 sample plots, 79% was in infected trees.

704. SINGER, O. Ein Beitrag zur Geschichte der medizinischen Verwendung der Mistel (*Viscum album* L.) und ihr Vorkommen auf der Eiche. **[The history of medicinal uses of mistletoe, and its occurrence on Oak.]** *Pharmazie, Berlin* 14 (2), 1959 (104–10). 37 refs. [G.g.] L.S.

Includes a discussion of host plants. While only two confirmed reports of *V. album* on *Quercus robur* s.l. are known from Germany, many more Oaks bearing mistletoe have been reported from England and France. None are known on Beech and Larch.

705. PHILIPSON, W. R. **Some observations on root-parasitism in New Zealand.** *Trans. Roy. Soc. N.Z.* 87 (1/2), 1959 (1–3). 15 refs. O.R.S.

It is shown that the endemic genus *Mida* (Santalaceae) and New Zealand species of *Euphrasia* (Rhinanthoideae) and *Exocarpus* (Santalaceae) are root-parasites. Roots of *Mida salicifolia* have been found with haustoria on *Agathis australis*, and of *Exocarpus bidwillii* on *Helichrysum selago*, but it is probable that none of these parasites is host-specific.

443. Fungi and Bacteria

See also Nos. 97, 170–5, 446, 645–6, 762–3.

706. JOHNSTON, A. **A supplement to a host list of plant diseases in Malaya.** *Mycol. Pap. Commonw. Mycol. Inst.* No. 77, 1960. pp. 30. 33 refs. Price 7*s.* 6*d.*

Enumerates diseases recorded between 1950 and 1958, including many forest tree species.

707. AZEVEDO, N. F. DOS SANTOS DE. Quelques maladies de l'*Eucalyptus* signalées au Portugal. **[Some diseases of Eucalypts recorded in Portugal.]** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/60-3g.* 4, 1960. pp. 7. 11 refs. [F.] Limited distribution.

Includes cases of frost damage, chlorosis, injury from atmospheric pollution, and a gummosis of unknown origin, as well as fungus diseases.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also No. 434.

708. VOROB'EVA, JU. V. Zagnivanie i uvjadanie vshodov kedr sibirskogo. **[Death of *Pinus sibirica* seedlings.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (255–7). [Russ.]

Young seedlings growing in the Moscow region were found to suffer seriously from attack by *Rhizoctonia*, *Fusarium* and *Botrytis* spp. Some control measures are outlined.

709. VOROB'EVA, JU. V. Mikrobiologičeskie metody bor'by s zagnivaniem prorostkov, uvjadeniem i poleganiem sejancev sosny. **[Microbiological methods of controlling rotting in germinating seeds, and wilting and damping-off in seedlings of Scots Pine.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (123–42). 14 refs. [Russ.]

Rotting, wilting, and damping-off of Scots Pine seed and seedlings were studied, and four types of damage determined: pre-emergence rotting; damping-off; seedling root-rot; and top wilting. Species of *Rhizoctonia* and *Fusarium* caused the worst damage, and *Botrytis* and *Verticillium* were also troublesome. Some 200 strains of mycolytic bacteria antagonistic to these fungi were isolated from peats, composts and greenhouse soils, and tested. Of these, 12 strains were selected for field trials. Scots Pine seeds treated with cultures of the antagonistic bacteria were sown in a medium clay-loam soil heavily infested with *Fusarium* and *Rhizoctonia*. All but two of the 12 strains gave positive results, seedling survival being up to 70% better than on control plots.

710. RIFFLE, J. W., and STRONG, F. C. **Studies in White Pine seedling root rot.** *Quart. Bull. Mich. Agric. Exp. Sta.* 42 (4), 1960 (845–53). 7 refs.

Reports on studies in 1957–58 at the Chittenden Nursery, Michigan, and Michigan State University. Of the total of micro-organisms isolated from 1832 diseased White Pine seedlings, 30·8% were *Fusarium* spp., followed by *Penicillium* (8·41%), *Trichoderma* (6·66%) and *Rhizopus* (6·60%). The % of isolation of *Fusarium* spp. increased with age of stock from 1 + 0 to 2 + 0 and 2 + 1, then decreased markedly with 2 + 2 plants, when the % of isolations of *Trichoderma*, *Penicillium* and bacteria increased. In two inoculation tests the recovery of *Fusarium* spp. from diseased plants after soil inoculation with isolates was 52·68 and 60·26%.

711. MOLIN, N., PERSSON, M., and PERSSON, S. **Root parasites on forest tree seedlings. Some exploratory tests of the resistance of germinant seedlings and the virulence of some potential parasites.** *Medd. SkogsforsknInst., Stockh.* 49 (1), 1960. pp. 17. 18 refs. [E.e.sw.*sw.*] Price *Kr.*1.00.

When heat-sterilized soil in glass jars was inoculated with cultures of 11 parasitic fungi isolated and re-isolated from infected conifer seedlings, and half the jars were treated with MeBr, emergence of Pine seedlings, sown 14 days later, was not greatly affected except by *Pythium debaryanum* (emergence nil) and *Rhizoctonia solani* (4%), but survival % after 50 days was greater in the MeBr-treated jars in all cases, and seedling weight in most. Inoculation of sterilized soil with saprophytic fungi resulted in most cases in higher survival %s than in untreated sterilized soils, and with *Mucor ramannianus* and *Trichoderma viride* (a viridin-producing strain) survival % also exceeded the higher rate in untreated unsterilized soil. In similar tests with *Fusarium solani*, differences in germination and survival between 6 seed provenances were considerable and not correlated with germination % in a Jacobsen tank. When Pine seed was grown in contact with extracts of varying concentration prepared from sterilized Spruce seed inoculated with parasitic or saprophytic soil fungi, only *F. culmorum* in high concentration markedly reduced germination %. Others, and pure seed extract, either had little, or, when diluted, a stimulating effect, reaching statistical significance at a dilution of 1:100 of the extracts made with *T. viride*, and *M. ramannianus*.

Seed extract in varying dilutions had generally an inhibiting, but occasionally a stimulating, effect on seed of two provenances. The complex factors involved, and particularly the role of saprophytic fungi as potential antagonists of parasitic species, are discussed.

712. HAGNER, M. Rotmurklan (*Rhizina inflata*)—en aktuell skadegörare på brända hyggen. **[Damage by *R. inflata* on burnt-over felled areas.]** *Norrlands SkogsvFörb. Tidskr.* 1960 (2), (81–96). 10 refs. [Sw.sw.]

Presents results of a survey in 1958–59 on 26 infected sites in Sweden, showing the extent of the damage, its relation to site properties and location, etc. The fungus attacked 1- to 6-year plants of Pine, Spruce and Larch and occurred in all parts of Sweden where clear-felled areas are burnt over, except N. Norrland. Plants from direct sowings are less susceptible than planted ones; when a site is found to be infected after burning over, 3–4 years should elapse before planting, but sowing can take place 1–2 years earlier. Natural regeneration is unlikely to be affected.

713. RIDÉ, M., and GUDIN, C. Sur la biologie de quelques champignons parasites de la châtaigne et plus particulièrement de *Phoma endogena* (Speg.). **[The biology of some fungi parasitic on Chestnut fruits, with particular reference to *P. endogena*.]** *C.R. Acad. Agric. France* 46 (9), 1960 (536–43). [F.]

An investigation into causes of decay in Chestnut fruits in France showed that two species are chiefly responsible, *Phoma endogena* and *Sclerotinia pseudotuberosa*. Notes are presented on the biology of these fungi, and on some inoculation experiments.

714. KRANGAUZ, R. A. Novoe zabolevanie sejancev duba na jugo-vostoke Evropejskoj časti SSSR. **[A new disease of Oak seedlings in S.E. European Russia.]** *Sborn. Rabot. Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (258–60). [Russ.]

The pathogen was identified as *Verticillium dahliae*. This is the first record of a fungus of this genus killing Oak seedlings in the U.S.S.R. Some control measures are outlined.

443.3. Diseases of Older Stages

715. VLASOV, A. A., and KRANGAUZ, R. A. Bolezni beloj akacii, duba i topolja v nasaždenijah Ačikulaksogo leshoza. **[Diseases of *Robinia pseudoacacia*, *Quercus robur and Populus nigra* in stands in the Achikulak leskhoz [Cis-Caspian lowland].]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (239–54). 1 ref. [Russ.]

Discusses stem and branch necroses, the most serious being one caused by *Cytospora foetida* sp. nov. on Poplar.

716. PRIMAKOVSKAJA, M. A. O nekotoryh gribah-vozbuditeljah nekrozov il'movyh porod. **[Some fungi causing necrotic diseases in Elms.]** *Soobšč. Inst. Les.* No. 10, 1958 (50–61). 16 refs. [Russ].

Describes fungi causing Elm diseases (mainly canker and dieback) in the Derkul and Tellerman forests, the most important being *Steganosporium compactum*, *Cryptosporella hypodermia* (conidial stage here named *Cryptosporium hypodermium*), *Dothiorella ulmi*, *Camarosporium cruciatum*, *Diplodia melaena*, *Cytospora ambiens* and *C. nivea*. General recommendations are made on silvicultural control.

Stem, Butt and Root Rots; Root Diseases

See also Nos. 496, 1101.

717. BASHAM, J. T., and VASILOFF, G. **Heartwood stain and rot in living Jack Pine.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (3), 1960 (1–2).

During 1952–55, a total of 4287 *Pinus banksiana* were felled and examined in the 6 main ecological regions of Ontario. It was found that age was the most important factor affecting the extent of decay. Region and site also significantly affect it. The greatest amount of heart rot was found in western and the least in eastern Ontario. Jack Pines growing on very dry sites had the most, and those on fresh sites generally the least decay. There was no evidence that the difference between E. and W. regions was due to difference in fungus populations, heartwood properties, or genetical composition of the hosts. The faster average growth rate in the eastern section of the Boreal Forest Region compared with that in the western section suggests that tree vigour is the critical factor. The differences in growth rate are probably the result of differences in climate and soil in the two regions.

718. BASHAM, J. T. **Studies in forest pathology. XXI. The effects of decay on the production of Trembling Aspen pulpwood in the Upper Pic region of Ontario.** *Publ. Dep. Agric. Can.* No. 1060, 1960. pp. 25. 5 refs.

In extension of an earlier paper stressing the mycological and pathological aspects of the present study [see *F.A.* 20 No. 2007], the author presents data, in tables and graphs, showing the relationships of decay to: (*a*) age of stand; (*b*) tree diameter; (*c*) site. (*a*) Old stands of *Populus tremuloides* generally contained much higher %s of decayed heartwood than young stands; in most of those younger than 80 years, $< 5\%$ of the total merchantable value (t.m.v.) was deducted because of heart rot, vs. $> 20\%$ for stands $\geqslant 140$ years old. (*b*) To determine whether there is any noticeable difference in the extent of heart-rot deductions between Aspen of different diameters, irrespective of age, the trees in each sample plot were classified into two groups: viz. $>$ and $\not>$ 9·5 in. d.b.h. A larger % of t.m.v. was deducted because of heart rot for the smaller trees, the difference increasing with increasing stand age and being particularly pronounced in stands of > 90 years. (*c*) The sites were arbitrarily divided into 4 categories, based mainly on the availability of soil moisture [cf. *F.A.* 14 No. 1419]. Variations in the extent of decay on these sites were not pronounced, though stands on deep, sandy silts or loams, or on shallow, sandy loams over

impervious material, were generally less defective than those on drier or wetter sites.

719. WESTHUIZEN, G. C. A. VAN DER. ***Polyporus sulphureus*, a cause of heart-rot of *Eucalyptus saligna* in South Africa**. *J. S. Afr. For. Ass.* No. 33, 1959 (53–6). 6 refs. [E. e. afrik.]

Describes the rot, and cultural characteristics of the fungus. It is found mainly in timber from old stands, and in the material studied, from the Zululand coastal belt, heavy damage was found in stands ca. 40 years old, whereas 8-year trees from the same area were free of it.

720. BAKSHI, B. K. **Heart rot of Sal in India**. *Commonw. phytopath. News* 6 (3), 1960 (45–6).

Presents tables, based on a study of 704 trees, showing (1) the significance of 5 types of external symptom as indicators of heart rot in Sal, and (2) the % of infected trees, average gross volume and average volume of decay per tree in 6 different diameter classes. The control of heart rot by silvicultural measures is briefly discussed.

721. CANTIANI M. Note sulla diffusione del marciume radicale nelle abetine di Vallombrosa. **[The extent of root rot in the *Abies alba* stands of Vallombrosa.]** *Ital. for. mont.* 15 (3), 1960 (122–4). 4 refs. [It.it.f.]

A statistical survey of the extent of *Fomes annosus* root rot shows that it is much greater in plantations established in 1886 on agricultural land or Chestnut sites than in the natural stands that have carried *A. alba* for at least 3 centuries.

722. RISHBETH, J. **Stump protection against *Fomes annosus*. I. Treatment with creosote. II. Treatment with substances other than creosote**. *Ann. appl. Biol.* 47 (3), 1959 (519–41 + 2 plates). 17 refs. O.R.E.

Reports on experiments in E. Anglia. (I) Creosoting Pine stumps immediately after felling commonly prevented the entry of *F. annosus*, and while *Ceratocystis* spp. and *Ophionectria cylindrospora* frequently entered, their growth tended to be slow. Light or delayed applications of creosote often failed to protect. In one experiment, creosoting controlled an air-borne *F. annosus* infection of Larch stumps. A gasworks creosote (b.p. 190–300° C.) was promising, while a tar/creosote mixture proved unsatisfactory. The disadvantages of creosote in stump protection are also discussed [cf. *F.A.* 18 No. 4225]. (II) Nitrogenous applications, especially NH_4 sulphamate, favoured growth of *Trichoderma viride* and *Penicillium* spp., which tended to suppress surface colonization by *F. annosus*. Other chemicals, e.g. urea (which encouraged *O. cylindrospora*) and $Na_2B_8O_{13}$ (which encouraged *Botrytis cinerea*), were initially toxic to stump fungi but were rapidly leached from the stump surface, allowing mould to develop that tended to suppress *F. annosus*. Stumps usually died more rapidly after such treatments than after creosoting, and often as fast as untreated ones. The effectiveness of treatments in preventing a major spread of *F. annosus* from roots already containing the parasite is variable. [Cf. *F.A.* 20 No. 708.]

723. MEREDITH, D. S. **Further observations on fungi inhabiting Pine stumps**. *Ann. Bot., Lond.* (*n.s.*) 24 (93), 1960 (63–78). 18 refs. O.R.E.

[Cf. *F.A.* 21 No. 1992.] Investigations were made on Scots and Corsican Pine in E. Anglia. Growth rates, both on malt agar and in stump wood, of early stump colonizers such as *Fomes annosus*, *Peniophora gigantea*, *Stereum sanguinolentum* and *Leptographium lundbergii* are higher than those of later-colonizing agarics. Initial invasion of stump roots is usually via the stump body by fungi infecting the cut surface. Although stumps may dry out appreciably soon after felling, in later stages of decay the m.c. of the wood often increases considerably. Stump decomposition is associated with a succession of decay fungi, the '*Peniophora*', '*Hypholoma*', and '*Tricholoma*' stages being distinguished. Several phycomycetes and fungi imperfecti colonize decayed but not fresh stumpwood. *P. gigantea* is a vigorous competitor of *F. annosus* for initial colonization of stumps, and may also compete with wood-rotting basidiomycetes and sometimes replace them in very decayed wood. *From author's summary.*

Wilts, Diebacks etc.

See also Nos. 715–6.

724. DONAUBAUER, E. Die Kieferntriebsterben-Kalamität 1959/60. **[The disastrous outbreak of Pine shoot disease 1959–60.]** *Allg. Forstztg.* 71 (9/10), 1960: *Suppl.* (*Informationsdienst* No. 32). pp. [1–2]. [G.]

Describes an outbreak of *Brunchorstia pini*, the imperfect form of *Scleroderris lagerbergii* [cf. *F.A.* 18 No. 1327] chiefly on *Pinus nigra* in the drier parts of Lower Austria, which was probably caused by exceptional shoot growth in a wet spring, followed by drought. The incidence was particularly heavy in 6- to 10-year-old mixed plantations of Pine and Robinia, where the Pine, possibly under the combined influence of N enrichment and competition for other nutrients, developed exceptionally long, soft and narrow needles. These could be seen developing even before the onset of the general symptoms, viz. discoloration from the needle base towards the top, progressing from the latest shoots inwards. Control by cutting out diseased parts or felling severely infected trees and burning the slash or treating it with a fungicide of long residual effectiveness is recommended, with a careful eye on the barkbeetle hazard created.

725. OUELLETTE, G. B., and GAGNON, C. **Formation of microendospores in *Ceratocystis ulmi* (Buism.) C. Moreau**. *Canad. J. Bot.* 38 (2), 1960 (235–41). 10 refs. O.R.S.

A morphological study of several isolates of *C. ulmi* showed that its spores and hyphae contain minute cytoplasmic particles that behave like spores (microendospores). The different stages of development of these are described, and some implications of the finding are briefly discussed. *From authors' summary.*

Cankers, Stem Rusts etc.

See also Nos. 154, 715–6.

726. SABET, K. A. **Studies in the bacterial diseases of Sudan crops. IV. Bacterial leaf-spot and canker disease of Mahogany (*Khaya senegalensis* (Desr.) A. Juss. and *K. grandifolia* C. DC.).** *Ann. appl. Biol.* 47 (4), 1959 (658–65 + 9 photos). 3 refs. O.R.E.

Reports, for the first time, a bacterial disease of Mahogany attributed to *Xanthomonas khayae* sp. nov., which is described. The disease causes rough or scabby leaf-spots and small knob-like cankers on the branches, which may die back. Symptoms differ to some extent with locality and host species. Infection of the leaves takes place through the stomata at any time of the year.

727. GILMOUR, J. W. **A root and stem canker of exotic conifers in New Zealand.** *Tech. Pap. N.Z. For. Serv.* No. 28, 1959. pp. 19 + 10 photos. 4 refs.

Covers field observations, description of the disease symptoms, isolation of, and pathogenicity tests with, the pathogen (referred to in this paper as the Glenbervie or GB fungus), cultural studies, and the probable identity of the causal agent. Group mortality in young stands of exotic conifers was found to be associated with death of roots and with collar or stem cankers, a basidiomycete being consistently isolated from diseased material of the tree species attacked, viz. *Pinus radiata, P. taeda, P. elliottii, P. pinaster, P. nigra, Pseudotsuga taxifolia, Chamaecyparis lawsoniana, Eucalyptus saligna*, and the shrubs Manuka (*Leptospermum scoparium*) and *Ulex europaeus*. First recorded in 1951 in the Glenbervie State Forest, the disease occurs most often in N. Auckland plantations but also in other areas of North and South Islands, available evidence strongly pointing to the contact between trees and Manuka or bracken as the main means of infection. In the north, group mortality due to this pathogen is common in areas of pure Manuka scrub. There is no previous record of the disease in New Zealand or elsewhere, and no fruiting body of the GB fungus has yet been found associated with the tree cankers, or in artificial cultures. The close similarity in morphological and physiological characteristics and pathogenic behaviour of cultures from the fruiting bodies of *Peniophora sacrata* from dead Manuka, and cultures from diseased trees, suggests that this fungus is responsible for the disease.

728. PURNELL, H. M. **Cypress canker.** *Repr. from Journal of the Department of Agriculture, Victoria* [1960]. pp. 2. 2 refs.

Describes the symptoms of the disease, caused by *Monochaetia unicornis*. No effective control is known for the disease in older trees. In view of its severity and rapid spread in Victoria, the Forests Commission has discontinued the propagation, planting and distribution of *Cupressus macrocarpa* and its varieties, and no longer recommends it for use in shelterbelts.

729. BIRAGHI, A. L'attuale situazione del 'cancro della corteccia' del castagno in Italia. **[The resent status of *Endothia parasitica* in Italy.]** *Schweiz. Z. Forstw.* 111 (7), 1960 (341–7). [It.g.]

Reviews the position geographically and discusses recent research [no full references] particularly on the susceptibility of species, the greater susceptibility of vigorous trees, and the reduced susceptibility of coppice from diseased stems, etc. The prospect for Chestnut coppice is considered quite hopeful.

730. KNEŽEVIĆ, I. Pokušaj mehaničkog suzbijanja *Dothichiza populea* na euramerickim topolama. **[An attempt at mechanical control of *D. populea* on hybrid Black Poplars.]** *Šum. List* 83 (10/11), 1959 (370–1). [Croat.]

In trials in the Osijek district, Slavonia, cankers were cut from the stems of 200 Poplar seedlings in April with a cobbler's curved knife, keeping 200 seedlings as controls. It was calculated from measurements in September that healing over was 12% greater on patches than on untouched cankers. The cut wounds had the further advantages of being free of dead bark, a possible point of entry for insect borers.

731. BUTIN, H. Über die Sporenkeimung von *Dothichiza populea* Sacc. et Br. in wässrigen Rindenextrakten verschiedener Pappelsorten. **[Spore germination of *D. populea* in aqueous extracts of bark of different Poplars.]** *Ber. Dtsch. Bot. Ges.* 73 (5), 1960 (185–97). 14 refs. [G.g.e.] O.B.D.

When bark of (1) *Populus trichocarpa*, (2) *P.* × *marilandica* and (3) *P.* × *robusta* was heated to 90° C. before comminution, spores of *D. populea* germinated equally well in aqueous extracts of all three. When extracts of otherwise untreated bark were previously exposed to the air for a short period, germination was completely inhibited in (1), strongly inhibited in (2), and unaffected in (3). Enzyme activity is probably responsible for these variations. When extracts of (1) were increasingly diluted, the inhibition effect decreased until, in the later stages, germination was promoted by the extracts. This suggests that a growth-promoting factor is present, the effect of which is cancelled at higher concentrations by that of a co-existing inhibiting factor. The addition of nutrients had no effect in extracts of (1), and only a slight effect in those of (2) and (3). The influence of the extracts on spore germination underwent seasonal changes. The inhibiting effect on (1) and (2) was not noticeable until extracts were made in autumn just before leaf-fall, and then persisted with all winter extracts, disappearing just before flushing. The effect was greater in extracts from younger tissues; during the growing season it was strong in leaves and buds, lower in green shoots and nil in bark ⩾ 1 year old. These results are discussed in connexion with the susceptibility of different Poplars. Parallels may be drawn between disease susceptibility and resistance, and the presence of germination-promoting or -inhibiting factors.

732. HUBBES, M. Systematische und physiologische Untersuchungen an Valsaceen auf Weiden. **[Systematic and physiological studies on Valsaceae from Willows.]** *Phytopath. Z.* 39 (1), 1960 (65–93). 50 refs. [G.g.e.] O.R.S.

The taxonomy of species of *Valsa, Leucostoma* and

Valsella [all falling under *Valsa s.l.*] was studied. The physiological characters studied are typical for the strains and cannot be used in delimiting species. All strains studied are pathogenic for 8 Willow species and *Populus tremula* × *P. tremuloides*. Differences in pathogenicity are considerable. *From author's summary.*

733. SCHOLZ, E. Befallsunterschiede und Resistenz bei *Pinus strobus* gegen *Cronartium ribicola* Dietr. = *Peridermium strobi* Kleb. **[Variations in attack, and resistance of *P. strobus* to *C. ribicola*.]** *Züchter* 30 (2), 1960 (61–72). 103 refs. [G.g.] E.M.B.

A study in 1955 and 1956 of the infection present in a research area laid out for provenance trials in 1936, and bordering on gardens containing black currants and other *Ribes* spp., showed considerable variation in resistance within and between provenances. There was no concentration of attack along the edge of the stand, but infected trees tended to occur in groups within the stand, suggesting that direct infection by aeciospores had occurred. In greenhouse experiments, 37 out of 40 plants, treated in 1954 with aeciospores brushed on to bark wounds, showed varying degrees of infection by 1957. In resistance studies in the field, 422 grafts from 27 parent trees and 800 four-year-old plants, interplanted with *R. nigrum* and *R. sanguineum*, were almost all infected 4 years after the experiment began. Infection was more severe and spread more rapidly on the more sheltered lower slopes than on upper slopes and tops of hills where there was more wind.

734. ARSEL, E. P. VAN. **Cycloheximide (Actidione), a new tool in White Pine blister rust control.** *For. Res. Note Wis. Coll. Agric.* No. 54, 1960. pp. 2. 1 ref.

Cycloheximide has proved effective against *Cronartium ribicola* on *Pinus monticola* [cf. *F.A.* 19 No. 614]. Present practices involve spraying the bottom 4–5 ft. of the stem with 120 p.p.m. cycloheximide in oil. All potentially damaging cankers, regardless of their location, are controlled on 40-ft. trees. All potential crop trees are treated, whether infected or not. Trials on *Pinus strobus* in the Lake States show promise but are too limited to justify any recommendation at present.

Foliage Diseases

See also No. 726.

735. BAKSHI, B. K., and SINGH, S. **A new genus in plant rusts.** *Canad. J. Bot.* 38 (2), 1960 (259–62). 2 refs. O.R.S.

Concludes from a study of the rust from needles of *Picea morinda*, hitherto known as *Chrysomyxa piceae*, that it does not belong to the genus *Chrysomyxa*. It is therefore re-named and described as *Ceropsora piceae*.

736. **[*Exosporium glomerulosum* disease of *Juniperus virginiana*.]** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1959*, 1960 (25–6).

Severe infections in N. and S. Carolina and Virginia have seriously damaged plantations, causing 10–15% mortality and rendering many plants unfit for sale as Christmas trees. Infection usually begins in the lower branches, progressing upwards and outwards; often only the needles on the tips of branches remain alive. There are indications that the blight can be controlled with bi-weekly applications of Phaltan [no details] at 2 lb./100 gal. water.

737. AGNIHOTHRUDU, V. ***Meliola albizziae* Hansford and Deighton from Assam.** *Curr. Sci.* 29 (4), 1960 (149). 1 ref. A.P.B.

M. albizziae is reported for the first time in India; it was discovered causing a sooty mould on shade trees of *Albizzia odoratissima*.

738. RAMAKRISHNAN, T. S. **Notes on some fungi from South India—VIII.** *Proc. Indian Acad. Sci.* 51*B* (4), 1960 (164–8 + 1 plate). 1 ref. O.R.S.

Including *Phytophthora palmivora*, causing severe defoliation of *Artocarpus hirsuta*.

444. Virus Diseases

739. IYENGAR, A. V. V. **Spike disease of plants.** *Indian For.* 86 (8), 1960 (489–96).

A study of the distribution of minerals in healthy and spiked plants of *Santalum album*, *Vinca rosea*, *Dodonea viscosa* and *Zizyphus oenoplia* showed striking changes in the total ash, N and Ca content of affected parts. A rapid mobilization of N from diseased roots to growing points was noted, contrasting with poor conduction of Ca. Thus the main defect appears to lie in the Ca supply. Carbohydrate accumulation, more evident in affected leaves and twigs than in the roots, is another important feature of the disease. The increased starch content is not caused by decreased amylase action, but is correlated with the lack of Ca. Protein synthesis fails to take place for the same reason. The Ca/N ratio proved a useful index of the presence of the disease, being very low in leaves and twigs and very high in roots of diseased plants. [Cf. *F.A.* 21 No. 4603.]

740. KRISTENSEN, H. R. **Report to the Government of India on the Sandal spike disease.** Expanded Technical Assistance Program, FAO, Rome. *FAO* No. 1229, 1960. pp. 31 + 5 photos. 29 refs.

Summarizes research carried out in the past, and describes the external symptoms of the disease as well as the histological, chemical, and physiological changes that take place in diseased plants. Suggests future lines of research and possible control measures.

45. Damage by Animals

741. RAFES, P. M. Voprosy zaščity lesa v issledovanijah po lesovedeniju. **[Problems of forest protection in investigations on forestry.]** *Trud. Inst. Les.* No. 48, 1960 (3–6). 64 refs. [Russ.]

Essentially a list of 64 works published since 1950 by the Forest Zoology Laboratory of the Forest Institute of the U.S.S.R. Academy of Sciences.

451. Mammals

742. **Cattle injury to planted Pines.** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1959*, 1960 (65–9).

In a study at Alapaha, Ga., 23% of planted Pine

were injured during the period of shoot development on lightly grazed open range, but 67% on heavily grazed, improved pasture, with mortality rates at 1st October of 6 and 65% respectively. Most of the damage was due to trampling and uprooting, and a repellent made little difference. In a study in Florida with different rates of cattle stocking, injury and mortality to planted *Pinus elliottii* (vars. *elliottii* and *densa*) and *P. palustris* increased greatly with denser stocking on freshly burned pasture, but not on one-year-old rough.

743. HOLIŠOVÁ, V. Potrava myšice křovinné *Apodemus sylvaticus* L. na Českomoravské vrchovině. **[Food of *A. sylvaticus* in the Vrchovina Českomoravská.]** *Zool. Listy, Brno* 9 (2), 1960 (135–58). 10 refs. [Cz.cz.g.g.] O.R.S.

Presents data in tables and graphs, showing the composition of the stomach contents at different seasons, in different habitats, by juveniles and adults, ♂s and ♀s, etc. Seeds, including a high proportion of tree seeds, formed 69·34% by weight of the stomach contents measured throughout 12 months.

744. DINESMAN, L. G. Vlijanie glubiny snega na vrednuju dejatel'nost' zajca-rusaka v južnyh rajonah Evropejskoj časti SSSR. **[Influence of depth of snow on the damage done by *Lepus europaeus* in southern European Russia.]** *Trud. Inst. Les.* No. 48, 1960 (189–99). 11 refs. [Russ.]

[Cf. *F.A.* 21 Nos. 3387–8.] From investigations at Dzhanybek and replies to a questionnaire, it was found that hare damage to trees and shrubs was worst in winters with normal or heavy snow immediately following a winter with light snow. After a winter with little snow, hares breed well, but, owing to the reduced soil moisture, grass supplies become scanty by the next winter; if heavy snow then falls, burying the normal food supply, the hares attack trees and shrubs. The possibility of predicting damage is discussed.

745. DAHLÉN, G., and ÅKERLUND, I. Redogörelse över hösten 1958 gjord undersökning av älgens skadegörelse på plant- och ungskog i södra delen av Delsbo socken. **[Report on a survey in autumn 1958 of damage by elk to seedling and young stands in the southern part of Delsbo parish.]** *Norrlands SkogsvFörb. Tidskr.* 1960 (2), (121–45). [Sw.]

Presents tabulated data on the extent of the damage, and attempts to assess the financial loss.

746. SZCZERBIŃSKI, W. Zabiegi pielęgnacyjne w drzewostanach świerkowych i sosnowych spałowanych przez grubą zwierzynę. **[Tending Spruce and Pine stands barked by game.]** *Sylwan* 104 (5), 1960 (37–44). 3 refs. [Pol.russ.e.]

Largely an exposé of German work. [Cf. *F.A.* 17 No. 4127; 21 No. 2028.]

747. MELICHAR, J., and FIŠER, Z. Spásání lesní vegetace jelení a srnčí zvěří. **[Browsing of forest vegetation by *Cervus* [*elaphus*] and *Capreolus* [*capreolus*].]** *Práce Výzkum. Úst. Lesn. ČSR* No. 17, 1959 (69–79). 14 refs. [Cz.russ.g.]

Stomach analyses revealed that almost all tree species were browsed, and that tree and shrub species formed ⩾ 50% of the total food. Recommendations are made to reduce browsing damage.

748. Het reeënvraagstuk. **[The roe-deer question.]** *Ned. Bosb. Tijdschr.* 32 (7), 1960 (247–60). 4 refs. [Du.]

A report by a special commission appointed in 1959, covering distribution and density of populations, damage in agriculture, forestry, etc., management problems (acceptable numbers, regulation, and the legal aspects) and recommendations (the responsibility of various bodies and individuals, compensation, and the need for further study).

749. KREFTING, L. W., and AREND, J. L. **Effect of deer browsing on a young Jack Pine plantation in northern Lower Michigan.** *Tech. Note Lake St. For. Exp. Sta.* No. 586, 1960. pp. 2.

Results of a 10-year study on two 40 × 40-ft. plots containing 26 trees each, (*a*) enclosed and (*b*) open to deer, showed that survival, mean height, and number of crop-quality trees were 25, 9·3 ft. and 22 respectively for (*a*), vs. 7, 4·5 ft. and 1 for (*b*). Estimated deer population in the area varied between 20 and 50 per sq. mile during the period.

750. ROY, D. F. **Deer browsing and Douglas-Fir seedling growth in northwestern California.** *J. For.* 58 (7), 1960 (518–22). 10 refs.

Describes observations in several areas (data tabulated) on browsing by *Odocoileus hemionus columbianus*, which is on the increase. Browsing on conifer seedlings was light where there was plenty of hardwood (Dogwood, Maple etc.) reproduction, but heavy where it was scanty. Browsing, though not generally fatal to conifer seedlings, seriously reduces height growth when repeated year after year.

751. VASIĆ, M. Ogledi hemiske zaštite kultura topole i vrbe od štetnog delovanja visoke divljači. **[Experiments in the chemical protection of Poplar and Willow plantations against game damage.]** *Šum. List* 83 (8/9), 1959 (326–32). 5 refs. [Croat.g.]

Anthropin, HT_1, and HT_8 were applied to trees in young plantations in the Danube and Tisza basins. All three chemicals failed to prevent extensive deer damage.

452. Birds

752. **Bird damage: multiple leader condition of White Pine.** *For. Pest Note Me. For. Serv.* 1960 (1), (6–7).

Flocks of grosbeaks, feeding on the terminal buds of young *Pinus strobus* in 1955, were found to be responsible for this widespread condition. In all cases examined in 1960, one of the replacing 'leaders' had gained dominance, so that only a slight offset was apparent at the point of abnormality.

453. Insects

See also No. 1117.

753. **Annual review of entomology. Vol. 5.** Annual Reviews Inc., Palo Alto, Calif. 1960. pp. 451. Many refs. Price $7.00 (60*s.*).

Includes *inter alia* the following reviews of literature: Insect flight muscles and their basic physiology

(*E. G. Boettiger*); Insect micromorphology (*G. A. Edwards*); Neurosecretion in insects (*W. G. van der Kloot*); The physiology of excretion in the insect (*R. Craig*); Cytogenetics of insects (*S. G. Smith*); Chromosomal variation and adaptation in insects (*A. B. da Cunha*); The phylogeny of Coleoptera (*R. A. Crowson*); Northern biting flies (*B. Hocking*); Evolution and biology of the termites (*F. M. Weesner*); Host selection in phytophagous insects (*A. J. Thorsteinson*); Some recent contributions to the study of the distribution and abundance of insects (*H. G. Andrewartha* and *L. C. Birch*); Sampling insect populations (*R. F. Morris*); Mechanisms of resistance against locust control (*D. L. Gunn*); Some aspects of the application of insecticides (*R. J. Coursbee*); Pesticides in relation to public health (*W. J. Hayes, Jr.*).

754. GAUSS, R. Über Nahrungspflanzenwechsel bei Insekten. [**Changes in choice of host plant by insects.**] *Z. angew. Ent.* 45 (3), 1960 (313–6). 13 refs. [G.e.] O.H.

Discusses recent reports of host changes apparently unconnected with shortages of the insects' normal food, including *Coleophora laricella* on Douglas Fir [cf. *F.A.* 19 No. 4499], *Liothrips setinodis* (normally feeding on deciduous trees and herbs) on shoots of young Silver Fir in the Schwarzwald, and *Acronycta rumicis* (usually feeding on fruit trees, shrubs, Poplars and Willow) on fresh needles and shoots of Douglas Fir and Larch seedlings in N. Württemberg.

755. JAHN, E., and SINREICH, A. Auftreten von Forstschädlingen in Österreich 1950–1959. [**Ocurrence of forest pests in Austria 1950–1959.**] *Anz. Schädlingsk.* 33 (8), 1960 (117–25). 21 refs. [G.]

Reviews and lists the most important outbreaks, and presents notes on control measures undertaken.

756. MAHNOVSKIJ, I. K. Vrediteli zaščitnyh lesnyh nasaždenijah Srednej Azii i mery bor'by s nimi. [**Insect pests of shelterbelts in [Soviet] Central Asia, and control measures.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (261–5). [Russ.]

A short general account.

757. RAFES, P. M. Formirovanie mira nasekomyh v lesnyh nasaždenijah na Narynskih peskah polupustynnogo Zavolž'ja. [**The insect world in forest stands on the Naryn sands in the Trans-Volga semi-desert.**] *Trud. Inst. Les.* No. 48, 1960 (129–88). 112 refs. [Russ.]

Describes the area, and lists in table all the insects found: (1) on the sandhills, (2) on the *ašiki* (depressions with dense grassy vegetation and sometimes also trees and shrubs), and (3) in the forest plantations in the hollows. The habitat of each insect is specified. Zoogeographical and ecological characteristics of the insect fauna are outlined, and particular attention is paid to the insects in the plantations (which consist mainly of Aspen, Scots Pine, *Alnus glutinosa*, *Elaeagnus angustifolia* and *Robinia pseudoacacia*), and their effect on the plantations. Though many of the insects are harmful, the damage they do is not serious enough to make the establishment of forests impossible.

758. RAFES, P. M. Nasekomye—vrediteli topolej, osin i iv, proizrastajuščih na Narynskih peskah polupustynnogo Zavolž'ja. [**Insect pests of Poplars, Aspens and Willows growing on the Naryn sands in the Trans-Volga semi-desert.**] *Trud. Inst. Les.* No. 48, 1960 (102–28). 51 refs. [Russ.]

A general account of the insects that attack indigenous and cultivated *Populus* spp. and *Salix* spp., viz. *P. canescens*, *P. nigra*, *P.n.* var. *italica*, *P. balsamifera*, *S. caspica*, *S. rosmarinifolia*, *S. acutifolia* and *S. alba*.

759. HAYWARD, K. J. Insectos tucumanos perjudiciales. [**Harmful insects of Tucumán.**] *Rev. industr. agríc. Tucumán* 42 (1), 1960 (3–144). 38 refs. [Span.] E.M.B.

Includes notes on insects damaging wood and woody species in the Tucumán region of Argentina.

760. WILFORD, B. H. **Forest-insect surveys in the central Rocky Mountains.** *J. econ. Ent.* 53 (3), 1960 (458–62).

Discusses the scope and object of survey techniques developed by the U.S. Forest Service in the forested areas of the central Rocky Mountains of Colorado, Wyoming and S. Dakota since 1947.

761. SILVA, F. AZEVEDO E. Les parasites du chêne-liège au Portugal. [**The insect pests of Cork Oak in Portugal.**] [*Docum.*] *5th Sess. Wkg. Party on Cork Oak FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/LG/60/3-Ab*, 1960. pp. 6. 2 refs. [F.] Limited distribution.

762. HARRISON, R. P., JR. **The insects and diseases of Aspen.** *Abstr. of thesis*, in *Dissert. Abstr.* 20 (12), 1960 (4478–9). O.R.S.

Presents results of a 4-year study of 462 $\frac{1}{10}$-acre plots and 1600 milliacre plots in virgin and cut-over Aspen stands (*Populus tremuloides* and *P. grandidentata*) in the 22 northernmost counties of Lower Michigan. Keys to the organisms found on Aspen have been made; the more important organisms are discussed in detail, and their economic importance more briefly, and the reactions between the parasitic organisms, the trees and the habitat are discussed. Insects and diseases (including shoot dieback, cutworms, and the Willow shoot sawfly) of Aspen suckers are largely responsible for the conversion of Aspen to other types. Insects and diseases of older trees (including Hypoxylon canker, heart rot and the Poplar borer) destroy more timber than is used each year, and severely reduce the value of standing trees. Recommended methods of silvicultural control are: (1), for regeneration of cut-over stands, operations to destroy or inhibit the development of bracken or low shrub growth and to remove the litter that provides the habitat for cutworms; and (2), for older trees, periodic thinning to reduce competition without making large openings in the canopy.

763. ZAHAROVA, V. N. Važnejšie vrediteli i bolezni barhata amurskogo i mery bor'by s nimi v pitomnikah i kul'turah. **[The main pests and diseases of *Phellodendron amurense*, and their control in nurseries and plantations.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz.Nauč.-Issled. Inst. Lesovod.* No. 35, 1958 (266–8). [Russ.]

The worst insect pest is *Psylla* sp., which can be controlled by sprays of anabasine sulphate, or by mineral-oil emulsions of DDT. The worst disease is a leaf rust caused by *Coleosporium phellodendri*, which can be controlled by dusting with sulphur.

764. MATHUR, R. N. **Pests of Teak and their control [in India].** [*Docum.*] *3rd Sess. FAO Teak Sub-Comm., New Delhi 1960* No. *FAO/TSC*-60/3.6, 1960. pp. 25. 18 refs. Limited distribution.

Lists the pests (99 in all) by type of injury, with notes on life history, parasites and predators, etc.

765. KOERBER, T. W. **Insects destructive to the Douglas-Fir seed crop in California—a problem analysis.** *Tech. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 45, 1960. pp. 36. 50 refs.

Reviews information on sampling and control methods and on four insects that regularly destroy large quantities of seed (*Barbara colfaxiana, Dioryctria abietella, Megastigmus spermotrophus, Contarinia oregonensis*). A research programme is suggested, and tabulated data are appended on (1) known or suspected destroyers of Douglas Fir cones or seeds, (2) insects found in cones, whose role is uncertain, (3) parasites and predators attacking insect pests of cones and seeds. [Cf. *F.A.* 21 No. 3416.]

766. KOZARŽEVSKAJA, Ė. F. Povreždenija nasekomymi plodov i semjan drevesno-kustarnikovyh porod v rajone Derkul'skoj Opytnoj Stancii polezaščitnogo lesorazvedenija. **[Injuries by insects to fruit and seed of tree and shrub species in the region of the Derkul Experiment Station for shelterbelt forestry.]** *Soobšč. Inst. Les.* No. 10, 1958 (62–75). 6 refs. [Russ.russ.]

Lists 33 insect pests of the seeds and fruit of 25 tree and shrub species, indicating the degree of damage. Factors affecting population density are briefly discussed, and recommendations made on chemical control.

767. MATHUR, R. N., SINGH, B., and LAL, K. **Insect pests of flowers, seeds, and fruits of forest trees.** *Indian For. Bull.* (*n.s.*) No. 223, 1958. pp. 105.

Arranged under host species, with an index of pests.

768. SCHEDL, K. E. Insectes nuisibles aux fruits et aux graines. **[Insect pests of fruit and seeds.]** *Publ. Inst. Nat. Étude Agron. Congo Belge* (*Sér. sci.*) No. 82, 1960. pp. 133. [F.]

Includes particulars of pests of a number of forest species in the Congo.

Insects: Natural and Biological Control

See also Nos. 764–5, 788–9, 792–4, 799, 802–3, 806–10, 813, 815–9, 823, 839, 847, 850, 853–4.

769. **Transactions of the first International Conference of Insect Pathology and Biological Control, Praha, 13–18 August, 1958.** Vydavatelstvo Slovenskej Akadémie Vied, Bratislava. 1959. pp. 654 + 2 plates. Many refs. [E.G.F. or Russ.e.g.f. or russ.] Price £3.

In addition to papers abstracted separately in this number of *F.A.*, the following papers of potential interest to foresters are included: Bacteria as microbial control agents (*E. A. Steinhaus*); The influence of sublethal doses of insecticides on outbreaks of insect diseases (*Ž. Kovačević*) [a preliminary report on research with *Lymantria dispar, Hyphantria cunea*, and *Euproctis chrysorrhoea* on outbreaks of latent diseases after treatment with low and very low (down to 0·0025%) concentrations of DDT]; Infection tests with *Rickettsia melolonthae* Krieg, and the histopathology of Lorche's disease of *Melolontha melolontha* larvae (*H. Wille*); The use of entomophagous fungi together with insecticides (*N. A. Telenga*); Some topics of insect virology (*G. H. Bergold*); Granulosis, a newly discovered virus disease of *Hyphantria cunea* (*L. Schmidt*) [a *Bergoldia* type, promising for use against all larval stages—cf. *F.A.* 21 No. 732]; A new nematode parasite [*Neoaplectana melolonthae*] of *M. melolontha* larvae in Czechoslovakia (*J. Weiser*); Taxonomical and ecological characteristics of species from the genus *Trichogramma* (*N. A. Telenga*) [host species, biological races, fertility in relation to humidity]; Biological control in forestry (*W. Koehler*) [illustrated by a control scheme in operation against *Acantholyda nemoralis*, involving the attraction or settlement of wild boars, birds, and ants, the dissemination of *Trichogramma* spp. and parasitic nematodes, and selective chemical control by poison rings—cf. *F.A.* 21 No. 783]; The use of polyvalent parasites or predators in biological control (*L. P. Mesnil*); Measures to promote the activity of oligophagous parasites in suppressing foci of major forest pests (*V. A. Shapiro*); Monophagy versus polyphagy in the choice of entomophagous insects in biological control (*C. L. Liu*); Parasitization of major forest pests in Czechoslovakia (1929–1958) (*S. Kolubajiv*) [tabulates data on parasitization rates; Hymenoptera were generally more effective than Diptera]; The biological control of major forest pests in Czechoslovakia (*A. Kalandra*); and Biological control of *Hyphantria cunea* in Slovakia (*E. S. Arbatskaja*) [supplements and brings up to date information in a previous paper—see *F.A.* 15 No. 481]. Each paper has a summary in another language.

770. BALCH, R. E. **Relationships between chemical and biological control of forest insects. I. General introduction and chemical control. II. Biological control, silvicultural methods and conclusions.** *Pest Technol.* 2 (8), 1960 (156–8, 160–1, 184–7). 17 refs. O.W.

A general article, with particular reference to Canadian conditions, concluding that the long-term object should be to create silvicultural conditions favourable to natural control. Where this is impossible, or fails, the possibilities of biological control should be investigated, and when neither silvicultural nor biological methods are effective, insecticides may be the only means of control.

771. RYVKIN, B. V. Značenie ėntomofagov i ih ispol'zovanie dlja ograničenija razmnoženija massovyh vreditelej hvoi i listvy drevesnih nasaždenij. **[The role of entomophagous insects in the control of mass outbreaks of foliage pests.]** *Transactions, First International Conference of Insect Pathology and Biological Control, Praha 1958*, 1959 (495–501). [Russ.g.]

Parasites of eggs and early larval stages are the most important, especially against most tenthredinids. Recommendations include transfer of parasitized eggs to the foci of fresh outbreaks, mass breeding of *Trichogramma* and *Telenomus verticillatus* for release in the forest, and timing of chemical control measures so as to spare the parasites. *From author's summary.*

772. GYÖRFI, J. Az erdö növényzetének hatása a fürkészdarazsak elszaporodására. **[The influence of forest vegetation on the rapid breeding of ichneumon flies.]** *Erdészettud. Közl., Sopron* 1959 (1), (81–93). 23 refs. [Hu.hu.russ.e.]

A study of the ichneumonid parasites of insect pests of forest trees shows the importance of a rich and abundant shrub and ground layer in providing the necessary milieu for the alternate and secondary hosts of the ichneumon flies. [Cf. *F.A.* 13 Nos. 3137–8.]

773. BERNDT, R., and RAPSCH, I. Weitere Untersuchungen über die Ernährungsweise des Trauerschnäppers (*Ficedula hypoleuca*) im Kiefernforst. **[The feeding habits of the pied flycatcher in Pine forests.]** *Waldhygiene* 3 (7), 1960 (218–22). 6 refs. [G.g.]

Analysis of the food of *F. hypoleuca* in the two Pine stands on the Lüneburg Heath [cf. *F.A.* 19 No. 3190] shortly after a successful control operation against *Panolis flammea* [cf. *F.A.* 19 No. 707], showed that ca. 50% of it consisted of the *P. flammea* parasite, *Ernestia rudis*. This predominance is not, however, considered an indication that the bird is harmful, for *E. rudis* was exceptionally numerous after the outbreak, which was countered by a highly selective chemical control operation (described). *From authors' summary.*

774. KOROL'KOVA, G. E. Osnovnye čerty dejatel'nosti djatlov v dubravah Tellermanovskogo massiva i Starobel' skih stepej. **[Main features of the activity of woodpeckers in the Oak forests of the Tellerman massif and the Starobelsk steppes.]** *Trud. Inst. Les.* No. 48, 1960 (7–58). 36 refs. [Russ.]

[Cf. *F.A.* 21 No. 3422.] Tabulates data on the distribution and populations of *Dendrocopus major*, *D. medius*, *D. minor*, *D. leucotos* and *Picus canus* from 1950 to 1956 in the various site types, and on their food (with results of stomach analyses) for adults both during the nesting period and at other times, and also for nestlings. Woodpecker activity in foci of infestation by insect pests of bark and wood (especially *Scolytus* spp., *Zeuzera pyrina* and *Hylesinus fraxini*) was studied by a method similar to one used in the U.S.A. [cf. *F.A.* 20 No. 2105]. It is concluded that woodpeckers should be protected, and encouraged by suitable silvicultural measures.

775. INOZEMCEV, A. A. O pitanii lesnogo kon'ka. **[The food of *Anthus trivialis*.]** *Agrobiologija* 1960 (3), (465–7). [Russ.] I.M.I.

Tabulates data on the food taken by nestlings and adults of *A. trivialis*. Insects harmful to trees or agricultural crops formed > 97% of all the invertebrates found in stomach analyses.

Insects: Silvicultural Control

See Nos. 762, 770, 824, 830, 836–7, 840, 853.

Insects: Chemical Control (General)

See also Nos. 446, 580–1, 645–6, 753, 763, 766, 769–70, 773, 781, 790, 795–7, 803, 813, 815, 827–8, 830–1, 837, 848–9, 853, 857, 1130.

776. BOOCOCK, D. **Modern insecticides and their use for protection of trees and timber.** *J. Inst. Wood Sci.* No. 5, 1960 (3–15). 23 refs.

Briefly reviews the insect pests of growing trees, logs, converted timber, and timber in use, and discusses the development of synthetic insecticides—notable DDT, γ-BHC, aldrin, dieldrin, and endrin—over the past 20 years, with information on their formulations and particular uses.

777. CONSTANTINESCU, E. Aerosoli în combaterea dăunătorilor forestieri pe cale chimică. **[Chemical control of forest pests by means of aerosols.]** *Rev. Pădurilor* 75 (5), 1960 (298–300). [Rum.russ.g.f.e.]

Describes successful experiments with Cometox, a mixture of DDT and γBHC in a petroleum-type carrier, developed in Rumania and applied by a Swingfog apparatus, against *Lymantria dispar*, *Malacosoma neustria*, *Tortrix viridana*, *Saperda populnea* and *Euproctis chrysorrhoea*. In stands not easily accessible by mobile equipment, good results were obtained with a fumigant—Fumigen 'F 3', a DDT/BHC mixture.

778. WORRELL, A. C. **Pests, pesticides, and people.** *Amer. Forests* 66 (7), 1960 (39–81).

A discussion of the fundamental problems posed by widespread use of pesticides (with specific reference only to insecticides), illustrated by a detailed account of attempts to control the gypsy moth (*Lymantria dispar*) in America over the past 70 years and the controversies which have resulted from extensive aerial applications of chemical insecticides.

779. DIETRICH, J. A. **Is tree spraying harmful to birds?** *Trees Mag., Ohio* 20 (5), 1960 (16–25).

Public opposition to the use of pesticides such as DDT, following reports of poisoning of wildlife, has interfered with vital work, e.g. in the Dutch Elm disease control programme. Evidence is adduced to show that these reports are not founded on fact, and that birds and other animals continue to thrive in regularly sprayed areas.

780. HARTENSTEIN, R. C. **The effects of DDT and malathion upon forest soil microarthropods.** *J. econ. Ent.* 53 (3), 1960 (357–62). 19 refs.

To determine the effects of plot treatments of

malathion and DDT on beneficial soil micro-arthropods, a study was made in 1958 in which 6 different treatments, (i) control, (ii) diluent, using the solvent that served as a vehicle for the insecticides in the other treatments, (iii, iv, v) DDT at 1, 10 and 50 lb./acre, and (vi) malathion at 2 lb./acre, were replicated 4 times on each of two sites, (*a*) a 23-year *Pinus resinosa* plantation and (*b*) a mixed hardwood stand, near Syracuse, N.Y. Collections over a one-year period before and after treatment in each habitat provided data for an analysis of variance. It is concluded that the organisms studied were not noticeably harmed either by the application of DDT at a concentration 10 times greater than that used in current U.S. forest pest control programmes (1 lb./acre) or malathion used a 2 lb./acre.

Thysanoptera

See No. 754.

Hemiptera

See also Nos. 652, 763.

781. SCHNAIDER, Z. O sposobie żerowania i probach zwalczania pieników (*Aphrophora* sp.) w plantacjach wierzb koszykarskich. [**Feeding of *Aphrophora* spp. in Osier beds, and control trials.**] *Sylwan* 104 (3), 1960 (41–5). 6 refs. [Pol.russ.e.]

Claims that, contrary to the opinion held by other authors [cf. *F.A.* 21 No. 4626], it is the imagos and not the nymphs of *A. alni*, *A. forneri* and *A. salicina* that cause the real damage to Osiers. Of several insecticides used as dusts or suspensions against larvae of *A. salicina* and *A. forneri*, BHC was the most effective. In trials with suspensions of DDT, BHC, Metasystox, Nikotan, dieldrin, malathion, Intox, Basudin, and allethrin against larvae of *A. alni*, only BHC was effective.

782. COZZO, D. Una enfermedad de los eucaliptos en la provincia de Misiones. [**A disorder of Eucalypts in the province of Misiones.**] *Rev. for. argent.* 4 (3), 1960 (101–2). [Span.]

In Jan. and Feb. 1960 a leaf wilt of *Eucalyptus saligna*, *E. rostrata* and their hybrids appeared in the subtropical province of Misiones, and was associated with the appearance in large numbers of *Cephisus siccifolius*, a pest of Leguminosae. The insects punctured the young bark of branches ⩽ 3 cm. in diam., and sucked the sap, meanwhile presumably injecting toxic substances that provoked histological disturbances in the surrounding tissue and impeded sap-flow. Among young nursery plants occasional deaths were reported, but in older trees the effects of the attack had diminished by the beginning of March, and the trees had begun to put out new shoots.

783. WALTON, B. C. J. **The life cycle of the Hackberry gall-former, *Pachypsylla celtidis-gemma* (Homoptera: Psyllidae).** *Ann. Ent. Soc. Amer.* 53 (2), 1960 (265–77). 17 refs. O.R.S.

The insect destroys buds; heavily infested trees appear unsightly, and young trees subjected to repeated attack may die.

784. KLOFT, W. Wechselwirkungen zwischen pflanzensaugenden Insekten und den von ihnen besogenen Pflanzengeweben. [**Reactions between plant-sucking insects and the tissues sucked.**] *Z. angew. Ent.* 45 (4), 1960 (337–81); 46 (1), 1960 (42–70). 130 refs. [G.g.e.] O.H.

A general investigation of reciprocal physical and chemical responses between sucking insects and various hosts, including research on cyto-chemical and physiological changes in the bark of Silver Fir in connexion with population fluctuations of *Adelges piceae* and *A. nüsslini* [cf. *F.A.* 19 No. 4476]. These changes, which include local accumulations of proteins and increases in the size of cell nuclei, are compared with gall formations.

785. KLOFT, W., KUNKEL, H., and EHRHARDT, P. Beitrag zur Lachnidenfauna Mitteleuropas. [**Notes on Central European lachnids.**] *Beitr. Ent.* 10 (1/2), 1960 (161–8). 19 refs. [G.g.e.russ.] O.H.

Briefly discusses the distribution of *Cinara kochiana* (on *Larix decidua*), *C. escherichi* (on *Pinus sylvestris*), *C. pectinatae* (on *Abies alba*), *C. pilicomis* (on *Picea abies* and *P. sitchensis*) and *Lachniella costata* (on various *Picea* spp.), with notes on their importance as honey-dew producers for bees, and on ant trophobiosis.

786. BRADLEY, G. A. **Occurrence of *Cinara* spp. aphids in British Columbia.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (3), 1960 (4).

Lists 27 species with their hosts. The number of species of *Cinara* that occur in a particular area seems to be related to the number of coniferous tree species.

787. SMITH, C. F. **A new species of aphid on Sugar Maple (Aphidae: Homoptera).** *Ann. Ent. Soc. Amer.* 52 (6), 1959 (647–9). O.R.S.

Drepanaphis simpsoni, on *Acer saccharum* in Canada and N.E. United States, is described and compared with *D. acerifoliae*.

788. DUNN, J. A. **The natural enemies of the lettuce root aphid, *Pemphigus bursarius* (L.).** *Bull. ent. Res.* 51 (2), 1960 (271–8). 10 refs.

P. bursarius inhabits galls on Poplar in spring and lives underground on lettuce during summer. An account is given of its parasites and predators at successive stages of its life cycle, and the role of fungal disease in control of sexuparae is briefly discussed.

789. KOSZTARAB, M. **Biological notes on the scale insects of Hungary.** *Ann. Ent. Soc. Amer.* 52 (4), 1959 (401–20). 17 refs. O.R.S.

Gives localities, collecting dates and host-plant data for 60 species in the collection of the Academy of Horticulture & Viticulture, Budapest, and lists the known parasites of each. Hungarian species now total 73, of which 16 are reported here for the first time. An alphabetical list of > 200 host plants, including many trees, is given, with the associated scale insects.

790. SCHINDLER, U. Einige Ergebnisse mehrjähriger Beobachtungen über Buchensterben und Buchenwollaus (*Cryptococcus fagi* Baer.). **[Some results of several years' observations on Beech bark necrosis and *C. fagi*.]** *Forst- u. Holzw.* 15 (10), 1960 (196–8). 7 refs. [G.]

[Cf. *F.A.* 17 No. 3029; 21 No. 2148.] *C. fagi* can be controlled by brushing it off the bark with wire brushes. The only insecticides giving good control are phosphoric ester preparations. [Cf. *F.A.* 22 No. 652.]

791. MCCONNELL, H. S., and DAVIDSON, J. A. **Observations on the life history and morphology of *Kermes pubescens* Bogue (Homoptera: Coccoidea: Dactylopiidae).** *Ann. Ent. Soc. Amer.* 52 (4), 1959 (463–8). 6 refs. O.R.S.

A detailed study of *K. pubescens*, a pest of *Quercus alba*, in Maryland.

Lepidoptera

See also Nos. 76–8, 754, 769, 773–4, 777–8, 829.

792. KERNER, G. Eine Mykose bei *Dasychira pudibunda* L. und ihre Verwendung zur biologische Bekämpfung von anderen Forstinsekten. **[A mycosis of *D. pudibunda* and its use in the biological control of other forest pests.]** *Transactions, First International Conference of Insect Pathology and Biological Control, Praha 1958*, 1959 (169–76). 4 refs. [G.russ.]

Describes tests with a fungus, identified as *Isaria arinosa* (possibly a conidial form of *Cordiceps militaris*) isolated from pupae in Beech stands near Eberswalde, where it had contributed to the collapse of an outbreak of *D. pudibunda*. *Lymantria monacha*, *L. dispar* and *Bupalus piniarius* were successfully infected in the laboratory; dusting with spores (especially in inert powders) was more effective than spraying with spore suspensions. Pupae of *Hyloicus pinastri* and *B. piniarius* were successfully infected only at r.h. > 90% and temperatures between 10 and 20° C. In open-air tests with *L. dispar* infected some 3 weeks before pupation, ca. 17% developed mycosis as larvae, 36% as pupae, and some even as emerging adults. In small-scale trials, *H. pinastri* pupae developed the disease within a few weeks when placed in trays under a 10-cm. layer of Pine litter which was dusted with a 1:1 mixture of spores and talc at 50 kg./ha. Exploratory laboratory tests shows that the fungus did not lose its germination or growth capacity if mixed with large doses of DDT, BHC, or both.

793. LEMARIE, J. Příspěvek k poznání cizopasníků makadlovky borové *Exoteleia dodecella* L. Část III Nadčeledi Chalcidoidea, Proctotrupoidea. **[The parasites of *E. dodecella*. III. Chalcidoidea, Proctotrupoidea.]** *Zool. Listy, Brno* 9 (3), 1960 (235–6). 2 refs. [Cz.g.] O.R.S.

[Cf. *F.A.* 21 No. 2072.] In 1958, 6 fresh species of Chalcidoidea were reared from *E. dodecella* and new information was collected for some of the species already reared in 1957 [see *F.A.* 20 No. 4863].

794. COPPEL, H. C., and SHENEFELT, R. D. **Parasites introduced to help control the European Larch casebearer—a progress report.** *For. Res. Note Wis. Coll. Agric.* No. 53, 1960. pp. 3. 2 refs.

Few insect parasites of *Coleophora laricella* were present in Wisconsin before the introduction in 1953 of the exotic species *Chrysocharis laricinellae* and *Agathis pumila*. Within 5 years both species have become established, and have spread from the point of introduction in N.E. Wisconsin. Collections of *C. laricella* from 29 counties in early 1959 showed 1–78% parasitization. [Cf. *F.A.* 20 No. 3426.]

795. GAYTOTÍN, P. T. Insecto destructor de la semilla de 'pino paraná', *Laspeyresia araucariae* Pastrana (Lepidoptera, Grapholithidae). **[*L. araucariae*, an insect attacking seeds of Parana Pine.]** *Notas tecnol. for. Adm. Nac. Bosques, B. Aires* No. 4, 1960. pp. [2]. 3 refs. [Span.]

Notes on biology, life history and damage inflicted. The damage has been partly controlled by dusting recently collected seed with 20% BHC (300–500 g./100 kg. of seed) and storing it in hermetically sealed containers.

796. DONLEY, D. E. **Field testing of insecticides for control of the Nantucket Pine moth, *Rhyacionia frustrana*, and the European Pine shoot moth, *R. buoliana*.** *J. econ. Ent.* 53 (3), 1960 (365–7). 2 refs.

Reports briefly on the results of field tests made in 1957–58 in which 19 insecticides (17 emulsions, a wettable powder and a suspension) were applied to *Pinus resinosa* and *P. echinata* stands in Ohio. The best results were obtained with certain emulsion formulations applied (rates given) to control the early larval instars of *R. frustrana* and *R. buoliana*, but the purely experimental nature of the tests is stressed, since no data were collected on the effects of the treatments on associated insects and wildlife, and further large-scale tests are needed before recommendations can be made.

797. BUTCHER, J. W., and HAYNES, D. L. **Influence of timing and insect biology on the effectiveness of insecticides applied for control of European Pine shoot moth, *Rhyacionia buoliana*.** *J. econ. Ent.* 53 (3), 1960 (349–54). 10 refs.

Spring and summer field insecticide applications were made to compare the effectiveness of selected chlorinated hydrocarbon and organic phosphate insecticides in the control of *R. buoliana*. Control obtained with spring applications of dimethoate, DDT, and Phosdrin (1-methoxycarbonyl-1-propen-2-yl dimethyl phosphate) confirmed earlier success with these materials. Guthion (*O, O*-dimethyl *S*-(4-oxo-1,2,3-benzotriazin-3-(4*H*-)-ylmethyl phosphorodithioate); methoxychlor; and Bayer 22408 (*O, O* diethyl *O*-naphthalimido-phosphorothioate) also showed promise. Evidence that resumption of spring feeding and larval migration may be protracted by weather in a given year suggests that timing of the spring insecticide application should coincide with initial pitch-blister ('tent') formation. Results of Sevin (1-naphthyl-N-methylcarbamate), DDT, and dimethoate applications made seven times between the period of 60% adult emergence and the date when 90% of the eggs had hatched (summer) give evidence that treatment should be

deferred until at least 50% of the eggs have hatched. Evidence that larvae always feed first in the needles and then in the buds of the tree, points to the desirability of having a maximum amount of insecticidal residue present at this time. *From authors' summary.*

798. MILLER, W. E. **The European Pine shoot moth: relationship between proportion of trees infested and number of insects per tree.** *J. For.* 58 (8), 1960 (647–8).

Presents a graph showing a regression for number of insects per tree on % of trees infested, derived from data from 69 sampling areas in Lower Michigan. Most of the samples (85%) were taken in *Pinus resinosa* plantations, 3–7 ft. tall; all were spaced at 6 × 6 ft. and had not reached crown closure. It is considered that in such plantations a sample of as few as 15 trees should provide the necessary index for obtaining a reading of the number of insects per tree from the graph.

799. KUDLER, J., LYSENKO, O., and HOCHMUT, R. Versuche mit der Anwendung von einigen bakteriellen Suspensionen gegen den Wickler *Cacoecia crataegana* Hb. **[Tests with bacterial suspensions against *C. crataegana*.]** *Transactions, First International Conference of Insect Pathology and Biological Control, Praha 1958*, 1959 (73–9 + 1 dgm.). [G.russ.]

Describes laboratory tests in which Oak leaves infected with various bacteria, including *Pseudomonas chlororaphis* isolated from a diseased population of *C. crataegana*, were fed to 4th- and 5th-instar larvae, and field trials in mixed deciduous stands near Litovel (Moravia) in an early stage of infestation (ca. 1·3 larvae/shoot), using fairly concentrated suspensions as mist sprays on small plots. Bacterial infections in the final developmental stages of *C. crataegana* occurred not only on treated plots but also in neighbouring stands (decreasing with distance) particularly near *P. chlororaphis* plots where populations were reduced by 60–78%. *B. dendrolimus*, the most pathogenic organism in the laboratory, was only found in, or close, to the plots. [Cf. *F.A.* 21 Nos. 2052, 2086.]

800. BLAIS, J. R. **Spruce budworm outbreaks and the climax of the boreal forest in Eastern North America.** *Rep. Quebec Soc. Prot. Pl. 1959*, 1960 (69–75). 19 refs. [E.]

Recapitulates, with additional evidence, the author's theory that Spruce budworm attacks are a phase in a natural cycle of events associated with the maturing of Balsam Fir [cf. *F.A.* 15 No. 2680].

801. BEAN, J. L. **Frass size as an indicator of Spruce budworm larval instars.** *Ann. Ent. Soc. Amer.* 52 (5), 1960 (605–8). 4 refs. O.R.S.

Frass width, but not its length or volume, shows correlation with the various larval instars of *Cacoecia fumiferana*. The mean width and the standard deviations for each instar are tabulated. Frass, collected in cone-shaped cloth traps in the field, can be used as an index of the % of each instar present.

802. BEAN, J. L. **The use of larvaevorid maggot drop in measuring trends in Spruce budworm populations.** *Ann. Ent. Soc. Amer.* 51 (4), 1958 (400–3). O.R.S.

The method is based on the assumption that if the % parasitization of budworm larvae by tachinids can be determined, the number of tachinid larvae falling on a unit area of ground (calculated from inverted cone traps) will be an index of the budworm population on the tree above. Estimates of significant differences between populations can be determined for any two years in one area or for any two areas at the same time.

803. MCCAMBRIDGE, W. F., and DOWNING, G. L. **Black-headed budworm.** *For. Pest Leafl. U.S. For. Serv.* No. 45, 1960. pp. 4. 4 refs.

Covers distribution, type of damage, host trees, evidence of infestation, description, life history and habits, and natural and chemical control (aerial spraying with a formulation of DDT in fuel oil is recommended).

804. SCHWERDTFEGER, F. Der Schaden des Eichenwicklers (*Tortrix viridana* L.). **[The damage caused by *T. viridana*.]** *Holz-Zbl.* 86 (105), 1960 (1450–2). 10 refs. [G.g.]

Reviews, on the basis of (mainly German) literature, the effect of periodic or continuous attacks on the stand as such, including mortality, fruiting, and regeneration, timber quality, including stem form, epicormics and regularity of ring width, and increment [cf. *F.A.* 20 No. 4884].

805. EIDT, D. C. **An unusual nursery pest.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (3), 1960 (1).

Larvae of a pyralid moth, *Nomophila* (?) *noctuella*, were found in 1959 causing damage to 1-year seedlings of *Picea rubens* and *P. glauca* in a New Brunswick nursery. Two-year seedlings of these species, of *P. mariana* and of *Pinus banksiana* were not attacked. The larvae cut off seedlings at ground level, dragged them into their burrows, and ate them there.

806. TALALAEV, E. V. Bakteriologičeskij metod bor'by s sibirskim šelkoprjadom. **[Bacteriological control of *Dendrolimus sibiricus*.]** *Transactions, First International Conference of Insect Pathology and Biological Control, Praha 1958*, 1959 (51–7). 18 refs. [Russ.g.]

Discusses methods and timing of dusting with a *Bacillus dendrolimus* preparation [cf. *F.A.* 19 No. 4523] in order to establish permanent foci of infection. From the small, localized primary foci where larvae had been directly infected, secondary infections spread over whole trees through dispersal of bacteria by rain and snow. As dead pupae were found to yield the bacteria most abundantly, the best time for application was just before pupation. Larvae of the 2-year generation treated before their first overwintering did not develop septicaemia until the spring, with a mortality rate of 66·5–97%. For this generation, the period for treatment covers the summer of the first year and the spring of the flight

year. For the 1-year generation, applications should be made in autumn or early spring. [Cf. *F.A.* 18 No. 1877.]

807. THOMPSON, C. G. **A polyhedrosis virus for control of the Great Basin tent caterpillar, *Malacosoma fragile*.** *Transactions, First International Conference of Insect Pathology and Biological Control, Praha 1958*, 1959 (201–4). 5 refs. [E.e.russ.]

Insect pathogens should not be expected to give the immediate direct control achieved by chemical insecticides, but their effect may prove to be longer lasting. Examples are given from trials of virus against *M. fragile* on Aspen. Application of a virus spray on small plots provided effective control only in the second year after treatment, but by then the disease was found ¼–½ mile from the treated plots. In recent aerial applications on 3 plots totalling 1500 acres, maximum first-year mortality was obtained with 30×10^9 polyhedra/acre in 2½ gal. of 20% corn syrup. The resulting mortality was 40–50%, and the treatment may be sufficient to start an epizootic. [Cf. *F.A.* 17 No. 625.]

808. VEBER, J. Ausnutzung einer Zytoplasma-Polyedrose im Pflanzenschutz. **[The use of a cytoplasmic [gut] polyhedrosis in insect control.]** *Transactions, First International Conference of Insect Pathology and Biological Control, Praha 1958*, 1959 (217–24). 41 refs. [G.russ.]

In small-scale field trials a polyhedral virus of the genus *Smithia*, isolated from *Lymantria dispar* and hand sprayed at a concentration of 21×10^6 polyhedra/ml. in aqueous suspension, caused third-instar larvae of *Euproctis chrysorrhoea* and larvae of *Malacosoma neustria* to cease feeding after the 6th–8th day and to die in masses after the second week. Mortality was almost 100%. The author stresses the greater reliability and infectiveness of *Smithia* viruses compared with those of the *Borrelina* type. In the laboratory, *Hyphantria cunea* and *Bombyx mori* were also easily infected.

809. TADIĆ, M. ***Malacosoma neustria* L., a new European host of the American fall webworm parasite—*Mericia ampelus* Wlk.** *Transactions, First International Conference of Insect Pathology and Biological Control, Praha 1958*, 1959 (361–5). 4 refs. [E.russ.]

M. ampelus, one of 8 parasites of *Hyphantria cunea* introduced into Jugoslavia [cf. *F.A.* 20 No. 3470], is univoltine in S. Canada, but has two generations a year in Jugoslavia, with a gap of 30–45 days in spring between the appearance of the young larvae and the availability of *Hyphantria cunea* larvae in a suitable state for parasitization (5th–6th instars). Laboratory experiments suggest that *Malacosoma neustria* might be a suitable alternative host to bridge this gap.

810. MÜLLER-KÖGLER, E., and HUGER, A. Wundinfektionen bei Raupen von *Malacosoma neustria* durch *Penicillium brevi-compactum* Dierckx. **[Wound infections on *M. neustria* larvae by *P. brevi-compactum*.]** *Z. angew. Ent.* 45 (4), 1960 (421–9). 11 refs. [G.g.e.] O.H.

Observations and experiments in the laboratory showed that the fungus, normally a saprophyte, can act as a wound parasite on these larvae, causing death in 5–10 days.

811. MORAVSKAJA, A. S. Biologija i nekotorye zakonomernosti izmenenija čislennosti zimnej pjadenicy v Tellermanovskom lesu. **[Biology and some trends in population dynamics of *Operophtera brumata* in the Tellerman forest.]** *Trud. Inst. Les.* No. 48, 1960 (59–101). 65 refs. [Russ.russ.]

Describes the forest types where the pest regularly occurs, its biology, population dynamics, distribution, and the influence of biotic and abiotic factors on numbers. It particularly attacks Elm and the early-flushing form of Oak. Foci of infestation are in the *Ulmetum graminosum*, *Quercetum graminosum*, *Q. convallariosum* and *Q. caesiosum* (all flood-plain types), and the *Q. salinum* and *Q. subsalinum* (both upland types). *O. brumata* is not found in Aspen and Willow stands, but occurs in all the other forest types. Conditions are most favourable for it in medium-aged stands, especially in the *Q. graminosum*, and biotic factors do not exercise any decisive control. A frost of − 41·3° C. in Feb. 1956 killed 99·3% of *O. brumata* eggs.

812. PALM, T. Följdverkningar av fjällbjörkmätarens härjning i Abiskodalen 1954–1956. **[Secondary effects of attacks by *Oporinia autumnata* on Birch in Abiskodal in 1954–56.]** *Ent. Tidskr., Stockh.* 80 (3/4), 1959 (120–36). 6 refs. [Sw.g.] O.R.S.

The Birch forests attacked were examined in 1958–59. Many trees proved to have been killed by the attack in combination with unfavourable weather, but a large number had sprouted from the base. *Hylecoetus dermestoides* and *Agrilus viridis* were present in large numbers. *H. dermestoides* attacked the base of the larger Birch stems on fresh or wet soils, killing many trees and the new basal shoots. *Agrilus viridis* was found on smaller trees on heaths exposed to the sun; damage was much less serious than that by *H. dermestoides*. *Empetrum* and *Vaccinium* ground vegetation types tended to be replaced [owing to opening of the canopy?] by grasses (e.g. *Deschampsia flexuosa*, *Festuca ovina*) and herbs (e.g. *Trientalis europaea*, *Linnaea borealis*).

813. ZOEBELEIN, G. Zur Beeinflussung der Insektenfauna des Waldes durch chemische Grossschädlingsbekämpfungen. 3. Mitteilung: Vergleichende Untershuchungen des Einflusses einer DDT-Behandlung mit Tifa-Gerät und mit Hubschrauber gegen die Kieferneule in Mittelfranken. **[The influence of chemical insecticidal treatments on the insect fauna of a forest. 3rd communication. Comparing DDT treatments with Tifa [fogging] equipment and helicopter against *Panolis flammea* in Central Franconia.]** *Z. angew. Ent.* 45 (3), 1960 (320–30). 8 refs. [G.g.e.] O.H.

Both methods were completely successful against *P. flammea* [cf. *F.A.* 20 No. 2085] and did comparatively little harm to parasites and indifferent insects [cf. *F.A.* 20 No. 4841]. Apart from the Psocoptera,and the lack of *P. flammea* itself as a host for parasites, the insect fauna could be considered about normal in numbers and composition

after 3 months. In general, the oil spray applied from the air did more damage to the rest of the fauna, some of the reasons being that it was applied in day time, at a rate of 1·1 kg./ha. DDT vs. < 1 kg. in the fog, and more of it penetrated to the ground because the droplets were heavier. It was also less rapid in its effect.

814. KLEPAC, D. Izračunavanje gubitka na prirastu u sastojinama koje je napao gubar (*Lymantria dispar*). **[The determination of increment loss in forests attacked by *L. dispar*.]** *Šum. List* 83 (8/9), 1959 (280–90). 4 refs. [Croat.f.*f.*]

A mixed stand in Lipovljani forest, 100 km. from Zagreb, containing 190 cu.m./ha. of *Quercus robur* (56% of stand volume), was heavily attacked by *L. dispar* in 1956. Volume increment in 1955, as calculated from 383 increment cores, was 7·0 cu.m./ha. vs. 4·6 for 1956 and 4·0 for 1957. The annual mean for 1950–55 was 7·0 cu.m./ha. Climatic conditions in the period were similar, and calculations for *Fraxinus angustifolia* showed a relatively constant increment. Thus the 30% loss of increment in Oak was attributable to *L. dispar* damage.

815. ANDROIĆ, M. Ekonomske i biocenotske posljedice kasnog tretiranja sastojina protiv gubara. **[Economic and biocoenotic consequences of late spraying of stands against *Lymantria dispar*.]** *Šum. List* 83 (12), 1959 (437–47). 12 refs. [Croat.e.]

A 40% loss of increment in Oak forests in the Lipovljani district in 1957, when trees were sprayed aerially with DDT, was attributed to the fact that the foliage, already reduced by *L. dispar*, remained in check throughout the growing season. In 1950, when complete defoliation occurred, loss in increment was only 30% because the trees flushed again. Late spraying, besides failing to maintain increment, also needlessly destroys beneficial insects. [Cf. preceding abstract.]

816. VASILJEVIČ, L. Les caractéristiques de l'épizootie de virose chez *Lymantria dispar* L. dans les régions de conditions climatiques différentes. **[The effect of climatic differences on the development of a virus epizootic in *L. dispar*.]** *Transactions, First International Conference of Insect Pathology and Biological Control, Praha 1958*, 1959 (215–6). [F.russ.]

The epizootic that ended the outbreak of 1953/57 in Jugoslavia was most severe on the southern slopes of low hills where the air was dry. In cool, very humid sites near mountain streams there was hardly any disease, and in the following year, trapping of ♂s showed that the highest numbers of moths occurred in these localities.

817. ČUGUNIN, JA. V. Očagovaja cikličnost' razmnoženija massovyh nasekomyh i mikrobiologičeskij metod bor'by s nimi. **[Cyclical occurrence of foci of mass insect outbreaks, and the microbiological method of control.]** *Transactions, First International Conference of Insect Pathology and Biological Control, Praha 1958*, 1959 (81–93). 11 refs. [Russ.e.]

Discusses the influence of climatic and other factors on the periodic outbreaks of *Lymantria dispar* in Crimea. These tend to collapse after 3 years through the agency of parasites and diseases, both the moth outbreaks and the diseases (caused by fungi, bacteria, protozoa, or virus) usually starting in the S. and spreading northwards. A powder made from dead larvae collected in areas of mass mortality, containing the various diseases present, was applied as an aerial spray (dilutions of 1/10,000 or 1/20,000 in water, at 20 litres/ha.) to third-instar larvae of *L. dispar* in a heavy infestation over 1000 ha. This treatment was followed by a larval mortality of 96·6% by the time of pupation; survival of larvae removed from the area before treatment, and separately reared, was 94·1%. Of sample pupae from the treated area, only 30% yielded imagos, and all of these were degenerate.

818. BARTHOS, G. Tanulságok a gyapjaspille-fertözöttség körül közremüködö madarak biológiai szerepéröl. **[Observations on the biological role of birds during an outbreak of the gipsy moth.]** *Erdész. Kutatás., Budapest* 6 (3), 1959 (1960), (207–26). [Hu.hu.russ.g.e.]

As a result of observations over some 27 years, the author concludes that birds are most effective in controlling *Lymantria dispar* at the egg stage (particularly tits, nuthatches, tree-creepers, and woodpeckers). The cuckoo and golden oriole are the chief predators on larvae. The provision of nesting accommodation for hole-nesting species, and also undergrowth for those nesting in bushes is essential. Egg masses should be sprayed with petroleum at the first signs of an outbreak, a measure carried out most economically during thinning and marking.

819. FANKHÄNEL, H. *Meteorus versicolor* Wesm. als Parasit von *Euproctis chrysorrhoea* L. und *Thaumetopoea processionea* und seine Einsatzmöglichkeiten. **[*M. versicolor*, a parasite of *E. chrysorrhoea* and *T. processionea*, and its potentialities for biological control.]** *Transactions, First International Conference of Insect Pathology and Biological Control, Praha 1958*, 1959 (415–20). [G.g.russ.]

Describes observations during an outbreak of these Oak defoliators in central E. Germany. In the phase of decline, particularly where both pests occurred together, parasitization rates of up to 37% in the second generation of *E. chrysorrhoea* and ca. 20% in *T. processionea* were found. Collection of pupae of the parasite in areas of high parasitization and their transfer to areas of low parasitization is thought to be promising, but care should be taken to exclude the many hyperparasites.

820. SERAFIMOVSKI, A. Pridones kon poznavanjeto morfologijata i biologijata na daboviot četnik (*Thaumatopoea processionea* L.) kaj nas. **[The morphology and biology of *T. processionea* [in Macedonia].]** *Godišn. Šum. Inst., Skopje* 3 (3), 1958 (83–117). 16 refs. [Maced.g.]

Presents the results of a 3-year study of *T. processionea*, a widely distributed pest in Macedonia. It attacks *Quercus pubescens, Q. sessiliflora, Q. conferta, Q. pedunculata, Q. cerris* and *Q. macedonica*, but chiefly the first two. Young trees may suffer

50% defoliation, but only isolated branches of mature trees are defoliated.

821. WELLENSTEIN, G. **The economic importance and the possibilities of control of the processionary caterpillar (*Cnethocampa* (*Thaumetopoea*) *pityocampa*).** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM*/60/2, 1960. pp. 2. Limited distribution.

A general note.

Coleoptera

See also Nos. 79–81, 174–5, 319, 769, 774, 777, 812, 1130.

822. ÈSTERBERG, L. K. Vrednye lesnye žestkokrylye Gor'kovskoj oblasti. [**Injurious forest coleoptera of the Gor'ki region.**] *Èntomologičeskoe Obozrenie, Moskva* 38 (4), 1960 (819–28). 6 refs. [Russ.] O.H.

Lists species of the Elateridae, Buprestidae, Bostrychidae, Lyctidae, Tenebrionidae, Cerambycidae and Scolytidae.

823. RUCKES, H., JR. **Observations on two species of Pine cone feeding deathwatch beetles in California (Coleoptera : Anobiidae).** *Ann. Ent. Soc. Amer.* 51 (2), 1958 (186–8). 4 refs. O.R.S.

Discusses the biology, habits and parasites of *Ernobius melanoventris*, whose larvae attack and destroy green cones of Jeffrey Pine in California. Sampling in the study area showed that 17% of the 1956 cone crop was attacked. *E. pinicola*, on Jeffrey and Ponderosa Pine, is also mentioned.

824. BASURMANOVA, O. K. Nekotorye zakonomernosti raspredelenija *Agrilus basurmanovae* Step. v Derkul'skih polezaščitnyh polosah. [**Some factors governing the distribution of *A. basurmanovae* in the Derkul shelterbelts.**] *Soobšč. Inst. Les.* No. 10, 1958 (76–82). 7 refs. [Russ.]

Infestations of *Acer platanoides*, *A. campestre* and *A. tataricum* by *Agrilus basurmanovae*, a bark and cambium borer which causes widespread damage in steppe shelterbelts, appear to be related to stand density, the heavier attacks occurring in open, well illuminated, warm places. To prevent serious attack the author recommends a high stand density (0·7–0·8), the introduction of understorey species, and surrounding the plantations with shrubs (preferably not *A. tataricum*). Satisfactory control of *A. basurmanovae* was obtained with trap logs (young trees, felled and having their branches removed).

825. **[Detection of *Oemida gahani*.]** *Extr.* from *Rep. E. Afr. Agric. For. Res. Organ. 1959*, 1960 (77–8).

The possibility of using ultrasonic pulse techniques and radiographic methods for detecting the borer within its host and evaluating the incidence and degree of infestation of plantations, has been investigated. Preliminary trials have shown that ultrasonic methods can be used to detect borer holes in otherwise sound wood, but considerable modifications of existing apparatus and experience in interpreting results are necessary before this method can be proved. Gamma-radiography and X-ray techniques also seem promising, but at present mpracticable. The use of a very small radioactive source with scintillation counter, however, seems both promising and economical.

826. EDWARDS, J. S. **Host range in *Prionoplus reticularis* White.** *Trans. Roy. Soc. N.Z.* 87 (3/4), 1959 (315–8). 10 refs. O.R.S.

Examines the host range of *P. reticularis*, now established in exotic conifer forests in New Zealand. It is reported from 14 gymnosperm and 2 angiosperm species. The endemic hosts are characteristic of lowland Podocarp forest. Only two genera, *Phyllocladus* and *Libocedrus*, are without record of attack. Host selection within *Podocarpus* and *Dacrydium* accords with recent views on the taxonomic grouping in these genera, based on pollen structure and chromosome number. *P. reticularis* was first noted on an exotic conifer (*Pinus radiata*) in 1914. It has become an important primary colonizer of fallen timber in exotic forest, attacking wood as soon as sap secretion ceases.

827. CONSTANTINESCU, E., and MANEA, D. Din experienţa lucrărilor de combatere a dăunătorului *Saperda populnea* L. [**Practical experience in the control of *S. populnea*.**] *Rev. Pădurilor* 75 (2), 1960 (90–2). [Rum.russ.g.f.e.]

Describes operations against an outbreak in a 10-year-old plantation of hybrid Black Poplars, using a German product (Multanin Nebelösung) and a Rumanian one (Cometox), both having the same active principle [unspecified] and applied by a Swingfog apparatus. Experiments were also made with 'F3' candles producing insecticidal smokes. Mortality of 80–100% was obtained both with the Swingfog applications at 6–8 kg./ha. and with the candles at a spacing of 20 × 25 m. (20 kg./ha.).

828. SZNAIDER [SCHNAIDER], Z. Z prób zwalczania krytoryjka olszowca (*Cryptorrhynchus lapathi* L.) w plantacjach wierzb koszykarskich. [**Trials in the control of *C. lapathi* in Osier beds.**] *Sylwan* 104 (3), 1960 (47–51). 9 refs. [Pol.russ.e.]

Attempts to control beetles overwintering in the soil by burning the litter layer failed, even when oil was used to assist the burn; the kills achieved were only 45–78%. Spraying in early spring with 10% DDT emulsion gave 54–71%, and a solution of DDT + BHC in oil, 54–83% kills. Spraying when the larvae were already feeding in the wood was a complete failure. Wofatox, Gamatex, Metasystox, dieldrin and Nikotan were disappointing against older larvae. The beetles were very resistant to contact poisons, especially DDT. Laboratory trials indicated that dieldrin (dust, 0·275% active principle) and aldrin (1% emulsion) were very effective against the adults.

829. JAHN, E., WETTSTEIN, O., and SINREICH, A. Schädlingsbefallsfolgen in einem Windschutzgehölzstreifen bei Tadten im Burgenland. [**Pests successively attacking a shelterbelt in Tadten, Burgenland [Austria].**] *Allg. Forstztg.* 71 (15/16), 1960: *Suppl.* (*Informationsdienst* No. 35). pp. 2. 4 refs. [G.]

Describes chiefly an epidemic of (*a*) *Pygaera anastomosis* [cf. *F.A.* 17 No. 630] which extensively

defoliated the Poplars forming ca. 60% of this 9-year-old belt, and could not be controlled by chemical dusts or sprays (largely because of an overlap of generations), but which collapsed the following year, and was followed by (*b*) *Cryptorrhynchus lapathi*, the first serious attack of this species recorded on Poplars in Austria. Contrary to their habits on Alder, the larvae covered the whole stem up to 3 m. from the ground with horizontal galleries, thus causing > 50% mortality in two belts in close proximity to an Alder wood.

830. WRIGHT, K. H. **Sitka-Spruce weevil.** *For. Pest. Leafl. U.S. For. Serv.* No. 47, 1960. pp. 6. 2 refs.

Covers distribution, extent and type of damage, life history and habits, natural enemies, chemical and silvicultural control (it is recommended that Sitka Spruce should be grown in closely spaced, well stocked stands, so that damaged leaders are replaced by one lateral shoot, and bushiness is avoided).

831. MEL'NIKOVA, N. I. Opyt bor'by s vtoričnymi vrediteljami eli pri pomošči jadohimikatov. **[Trials to control secondary pests of Spruce with insecticides.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (90–105). 5 refs. [Russ.]

An account of trials, covering several years, of DDT and BHC sprays and dusts, against *Ips* spp. and *Pityogenes chalcographus*.

832. CHARARAS, C. Relations entre la pression osmotique des conifères et leur attaque par les Scolytidae. **[Relationship between osmotic pressure in conifers and attack by Scolytidae.]** *Rev. Path. vég.* 38 (4), 1959 (215–33). 10 refs. [F.g.] I.M.I.

[Cf. *F.A.* 20 No. 4913; 21 No. 2119.] Osmotic pressure (o.p.) was studied in *Pinus pinaster*, *P. sylvestris* and *Picea abies* suffering from barkbeetle attack, in 4 forest regions (Fontainebleau, Landes, Morvan and Haute Savoie). The optimum is closely related to the vitality of the tree, and therefore to climatic, soil, and silvicultural conditions, but the optimum for one species may vary from one stand to another. It is always trees of low vitality and low o.p. in the bark that are attacked. Certain primary pests, however, will attack trees in which o.p. approaches the optimum, e.g. *Ips sexdentatus* on *P. pinaster* and *Ips typographus* on *Picea abies*. Other, secondary, pests only become established when o.p. does not exceed 4–5 atm., e.g. *Hylurgops palliatus*, *H. glabratus*, *Dryocoetes autographus* and *D. hectographus*. The o.p. in the zone of attack is more important than the general vitality of the tree. Where o.p. varies in the same stem, attacked portions may therefore be found alongside healthy ones. Although resin-flow is closely related to tree vitality and is stimulated by attack, it cannot be considered an effective protection. Choice and use of trap trees are discussed; lopped trees in the shade are generally recommended.

833. CHARARAS, C., DESVEAUX, R., and KOGANE-CHARLES, M. Relations entre l'installation des coléoptères Scolytidae et la teneur des conifères en glucides solubles et en acides organiques hydrosolubles libres. **[Relationships between attack by Scolytidae and the content in conifers of soluble sugars and free water-soluble organic acids.]** *C.R. Acad. Sci., Paris* 250 (5), 1960 (921–3). [F.] O.R.S.

[Cf. *F.A.* 21 No. 757.] Studies were made on the cellular and extra-cellular liquid of bark samples of sound and unhealthy trees of *Picea abies* and *Pinus sylvestris*. The following conclusions are drawn: (1) Variations in osmotic pressure are paralleled by variations in quantities of dry matter, sugars, and water-soluble organic acids, these changes being associated not with the species but with the physiological condition of the tree; (2) the proportion of dry matter is much higher in sound than in attacked trees (20 vs. 2%); (3) the rate of development of Scolytidae appears to be closely related to the amount of soluble sugars; (4) free organic acids (chiefly malic, citric, quinic, shikimic and formic) were present only in small amounts in the attacked tree (0·6 millilitres/100 ml. vs. 9·01 in the sound tree); (5) amino acids were found in all samples studied.

834. CHARARAS, C. L'attractivité exercée par *Fraxinus excelsior* L. à l'égard de *Leperesinus fraxini* Panz. (Coléoptère Scolytidae) et les modifications physiologiques de la plante-hôte. **[The attraction of *F. excelsior* for *L. fraxini* and physiological modifications in the host plant.]** *C.R. Acad. Sci., Paris* 250 (23), 1960 (3872–4). [F.f.] O.R.S.

These studies showed that *L. fraxini* attacks no other species when Ash is present, but that in its absence a small % of insects will attack *Syringa vulgaris* (20%), *Quercus robur* and *Fagus sylvatica* (each 10–12%). When a sample of Ash was added to the other species, insects so far inactive began to attack it and those on the other species transferred to the Ash. *Arbutus unedo* was not attacked, even in the absence of any other food. Other species attacked did not react by forming the tumours characteristic of Ash. A study of the hypertrophied zone showed a reduction in osmotic pressure (a maximum of 8·42–8·82 atm. vs. 9·86–10·25 in healthy parts) and in total sugar content (3·4 vs. 6·3 g./ml.); stachyose, sucrose, glucose and fructose were identified from the cortical liquid of healthy parts. Attack by *L. fraxini* does not appear to provoke more than localized physiological disturbance, nor to reduce the tree's resistance; other factors, e.g. drought, may expose the tree to heavy attack and modify its resistance. In such conditions, as many as 300 larvae have been found in 20 sq. cm., and the tree has died within two months.

835. ADLUNG, K.-G. Über die Ergebnisse der im Schwarzwald 1958 und 1959 durchgeführten Freilandversuche zur Anlockung von Borkenkäfern mit Lockstoffen. **[Field tests with barkbeetle attractants in the Schwarzwald, 1958 and 1959.]** *Z. angew. Ent.* 45 (4), 1960 (430–5). 5 refs. [G.g.e.] O.H.

Methyl esters of fatty acids from linseed oil [cf. *F.A.* 18 Nos. 3121–2] sprayed on to the bark of felled Spruce trap trees, greatly increased their attractiveness to *Ips typographus*, particularly in cooler weather. During hot summer weather, the differences between treated trees and controls were small.

Treated standing Spruce with damaged crowns strongly attracted *Hylurgops glabratus*. Treated standing trees and controls attracted *Xyloterus lineatus* about equally.

836. SCHWERDTFEGER, F. Scolytidae (Col.) an *Pinus*-Arten in Mittelamerika. V. Das Massenauftreten von *Dendroctonus adjunctus* Blandf. in Guatemala. **[Scolytidae on *Pinus* spp. in Central America. V. Mass outbreaks of *D. adjunctus* in Guatemala.]** *Z. angew. Ent.* 46 (1), 1960 (1–33). 24 refs. [G.g.e.] O.H.

[Cf. *F.A.* 21 No. 770.] A study of the large-scale injuries to forests between 2000 and 4000 m. alt., almost entirely on *Pinus rudis*, discussing, on the basis of literature and the author's research, the behaviour of *D. adjunctus*, its host relations, economic importance, etc. It was found that the beetles, though attracted by felled Pines, did not attack these, but did attack healthy trees after being attracted by the smell of the felled ones. Pruning, fire damage, and attacks by *D. valens* also favoured attack by *D. adjunctus*, but larval mortality in these weakened trees was higher. Outbreaks as a rule declined fairly quickly, but new foci were continually formed as a result of felling, storm damage etc. For prevention, replacement of *P. rudis* by less susceptible species, e.g. *P. ayacahuite* or *P. pseudostrobus*, and avoidance of fellings during the swarming season, and removal of felled trees before it, are recommended. For control, the author advises felling and barking of trees before the beetles leave them, coupled with burning of bark, deliberate scorching of trees, etc.

837. FURNISS, M. M. **Reducing Douglas-Fir beetle damage—how it can be done.** *Res. Note Intermt. For. Range Exp. Sta.* No. 70, 1959. pp. 6. 2 refs.

The biology and characteristics of infestation of the beetle are outlined, and recommendations based on a study begun in S. Idaho in 1956 are made for its control. These include: early location and prompt salvage logging of infested trees; bark-penetrating insecticides [cf. *F.A.* 19 No. 728]; salvaging of windthrown trees; and silvicultural treatment.

838. SUGDEN, B. A., and ROSS, D. A. ***Ips oregoni* (Eich.) in Ponderosa Pine, Interior British Columbia.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (3), 1960 (3).

Outbreaks of *I. oregoni* occurred during the summers of 1957, 1958, and 1959 in many overstocked stands of young Ponderosa Pine in the southern interior of British Columbia. A total of 1690 young trees with a mean d.b.h. of 6 in., is recorded as killed by this insect during the period. With one exception, infestations occurred on sites bordering on recent logging or land-clearing operations, where most of the debris consisted of Ponderosa stumps and slash that had been heavily infested.

839. DOANE, C. C. ***Beauveria bassiana* as a pathogen of *Scolytus multistriatus*.** *Ann. Ent. Soc. Amer.* 52 (1), 1959 (109–11). 8 refs. O.R.S.

B. bassiana was the organism most frequently found in a survey for pathogens of *S. multistriatus*, occurring in larvae from 5 widely separated areas in Connecticut. Up to 6·5% of overwintering larvae in felled street trees were infected, but under certain conditions the fungus may be much more effective. In one area 97% of larvae were killed in the bark of trees in a shady grove vs. 4% for near-by trees in the open. In laboratory tests the fungus killed up to 99% in 5 days. Pupae and adults were also susceptible, adults slightly less so than larvae.

840. **The influence of silvicultural practices on the build up of populations of ambrosia beetles in high forest.** *Extr.* from *Rep. W. Afr. Timb. Borer Res. Unit 1958/59*, 1960 (9, 23–4).

A study of the effect on beetle populations of heavy poisoning of weed trees in forest reserves suggests that a build-up in the numbers of Platypodidae may occur, but no definite conclusions can yet be drawn.

841. **The borer of Ofram.** *Extr.* from *Rep. W. Afr. Timb. Borer Res. Unit 1958/59*, 1960 (8, 21).

The borer making tunnels 2 mm. in diam., associated with an orange stain, in *Terminalia superba* has been identified as *Doliopygus dubius*. Examination of 43 felled trees showed evidence of tunnels in trees in the girth classes 1–3, 3–5 and 5–7 ft. *D. dubius* is not host-specific and can live in dying trees. Black heart of *T. superba* may be caused by fungus attack associated with *D. dubius*.

842. **The borer of Wawa.** *Extr.* from *Rep. W. Afr. Timb. Borer Res. Unit 1958/59*, 1960 (8, 10–21, 33–4 + 2 plates).

The insect causing holes ca. 3 mm. in diam., associated with a black stain, in *Triplochiton scleroxylon*, has now been identified as *Trachyostus ghanaensis*, specific to this host and occurring only in living trees. The mode of attack, first occurring in trees with girths of 2–3 ft. and heaviest in those with girths of 5–7 ft., is described, and the life history of the insect and its distribution, chiefly in Ghana and the Ivory Coast, are discussed. Attack is heaviest in dense forest, rather than in that opened up for farming, and where the trees are growing on badly drained soil. There are indications that the attack may reach a peak in the wet season, but insufficient evidence is yet available. [Cf. *F.A.* 21 No. 3494.]

843. MOORE, K. M. **Observations on some Australian forest insects. 4. *Xyleborus truncatus* Erichson 1842 (Coleoptera: Scolytidae) associated with dying *Eucalyptus saligna* Smith (Sydney Blue-Gum).** *Repr.* from *Proc. Linn. Soc. N.S.W.* 84 (2), 1959 (186–93). 8 refs.

Describes investigations into the causes of numerous deaths of *E. saligna* and into the relationship between *X. truncatus* attack and brown staining in the wood of dying trees. Biology, hosts and distribution of the insect are given and typical damage is described and illustrated. The quantity of commercial timber destroyed in two areas of greatest tree mortality is assessed, and factors apparently contributing to beetle attack and tree mortality are discussed. *From author's summary.*

844. EGOROV, H. H. Materialy po biologii hruščej (Col. Scarabaeidae) zony lentočnyh borov Altajskogo Kraja. **[The biology of chafers of the zone of ribbon-like Pine forests in the Altai region.]** *Entomologičeskoe Obozrenie, Moskva* 39 (2), 1960 (313–26). 38 refs. [Russ.e.] O.H.

Presents observations on 14 species from the region between the Ob and Irtysh rivers, with special attention to the bionomics, temperature and moisture requirements, etc. of *Melolontha hippocastani*, *Amphimallon solstitialis* and *Polyphylla alba*, whose larvae were the most injurious to Pine plantations and young natural regeneration. *A. solstitialis* also caused serious damage to Pine plantations under steppe conditions. *From author's summary.*

845. POPOV, P. A. Untersuchungen über die Gattung *Melolontha* in Bulgarien. **[Studies on the genus *Melolontha* in Bulgaria.]** *Z. PflKrankh.* 67 (7), 1960 (399–407). [G.g.e.] E.M.B.

Lists the species found, and discusses the distribution, preferred hosts, biology, prediction of attack and control of *M. melolontha.*

Hymenoptera

See also Nos. 82, 769.

846. RAFES, P. M. Tipy hodov rogohvostov i zakonomernosti povedenija ličinki, opredeljajuščie formy ee hoda v drevesine. **[Types of tunnels made by Uroceridae and larval behaviour patterns which determine the shape of the tunnels in wood.]** *Dokl. Akad. Nauk SSSR* 132 (2), 1960 (478–80). 8 refs. [Russ.] A.P.B.

Distinguishes four types of tunnel made by *Paururus* [*Sirex*] *noctilio* in *Pinus sylvestris* in Siberia. The longest and most complex tunnels with the widest openings were in the thickest stems and the healthiest trees; the shortest and simplest tunnels with small openings were in thinner stems and dying trees. Changes in tunnelling behaviour in the various larval stages are discussed. The direction and length of tunnels appear to be determined by the larval instar concerned, change of direction indicating the need for mechanical support in getting free from the exuviae.

847. NOVAKOVÁ, E. Note préliminaire sur la contribution du sanglier sauvage á la lutte biologique contre les tenthrèdes du genre *Cephaleia.* **[The role of wild boar in the biological control of *Cephaleia* spp.]** *Transactions, First International Conference of Insect Pathology and Biological Control, Praha 1958*, 1959 (559–63). [F.russ.]

In pure Spruce stands in the Erzgebirge, heavily infested with *C. abietis* and *C. arvensis*, the density of larvae, pupae and adults on sample plots where boars had rootled was only 25–30% of that on undisturbed controls, the destruction in the litter and raw-humus layers being practically complete. The soil was disturbed under ca. 40% of the trees. The boars did not rootle where the ground flora was dense,but in such areas larval populations were low even under rather heavily defoliated trees.

848. KALANDRA, A. Výzkum účinků zamlžování aerosolem DNC ručním pulsačním generatorem proti ploskohřbetce smrkové *Cephaleia abietis* L. **[Results of using DNC aerosol with a hand operated pulsation-generator against *C. abietis*.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 17, 1959 (231–56). 100 refs. [Cz.russ.g.]

[Cf. *F.A.* 21 No. 720.] Trials were made in 1955 with a 10% aerosol of DNC (Dynocid) (DDT base) to control *C. abietis* in pure Spruce plantations. In the first trial (in a plot of 1 ha., tree height 14–17 m.), timed to destroy the youngest larval stage, the kill was 66%. In the second trial, held under similar conditions, it was found that the sprayer was suitable in stands 10–18 m. high, but that the taller the trees, the more uncertain the results. Given good climatic conditions, a dose of 4–5 kg. aerosol/ha. was sufficient. Larvae died within 1–3 days. Exposure of larvae for 60 and 30 sec. to the mist from a distance of 10 m. resulted in 100% kill; exposure for 10 sec. gave 95% kill, 5% still being alive after two days.

849. WIHR. Grossbekämpfung der Kiefernbuschhornblattwespe im Raum Mittelfranken, Oberfranken und in der Oberpfalz. **[Large-scale control of *Diprion* sp. in Central and Upper Franconia and the Upper Palatinate.]** *Holz-Zbl.* 86 (106), 1960 (1462–3). [G.]

Describes operations covering > 5000 ha., in which DDT in diesel oil, sprayed at 15 litres/ha. (0·7 kg. active ingredient) from helicopters in June and July, killed nearly all larvae and, at the earlier dates, many ovipositing ♀s at a cost of ca. 29 DM/ha. The outbreak, attributed to the 1959 dry summer, was the first serious one in the region for 140 years.

850. BUTOVITSCH, V., NOTINI, G., and WETTSTEIN, S. VON. Tallstekelvirus—ett nytt biologiskt bekämpningsmedel? **[The virus of *Diprion sertifer* as a new means of biological control?]** *Skogen* 47 (16), 1960 (303–4, 310). [Sw.]

The experiment was made in an area where the virus had not previously been found. Trees were isolated by covering them with nylon material and were provided with healthy larval colonies. Control trees were left untouched; the rest were sprayed, when the larvae were in the 4th instar, with a suspension of the virus and then left undisturbed. About 10% of the larvae died; the remainder pupated and emerged normally, and eggs were laid in plenty on the needles. In the next year a number of eggs were hatched out and the larvae transferred immediately to fresh needles; all developed symptoms of the virus, which must have been transmitted via the eggs of the ♀s infected as larvae. A further study of the experimental trees during spring and summer showed that 95% of the total populations of larvae died with typical virus symptoms; microscopical examination confirmed the presence of polyhedra. The virus appears to be specific to *D. sertifer*; attempts to use it for control of *D. pallipes* failed.

851. MCINTYRE, T. **The Virginia Pine sawfly outbreak 1955–1959.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 99, 1960. pp. 4. 1 ref.

An account of the outbreak of *Neodiprion pratti pratti*, now extending over an area of > 14,000,000

acres in Maryland, Virginia, and N. Carolina. Principal hosts are *Pinus virginiana*, *P. rigida*, and *P. echinata*. The outbreak is expected to continue in 1960.

852. PETERSEN, B. B. **Some observations on the mortality of *Pristiphora abietina* (Christ) and other Spruce Nematini during the oviposition period, and on the effect of temperature on flight intensity.** *Oikos* 11 (1), 1960 (72–9 + 1 tbl.). 9 refs. [E.]

Climate or 'weather' as a mortality factor in insect populations is briefly discussed. Field observations on the flight of *P. abietina* and other Spruce sawflies were carried out in 1955–56 in South Jutland. Flight occurred at temperatures $\geqslant$ 11–13° C. The peak of flight and oviposition took place at $\geqslant$ 18°. In both years the flight was ended by thunderstorm rain, which appeared to cause heavy mortality. Other examples of mortality in *P. abientina* caused by climate are discussed. [Cf. *F.A.* 19 No. 4575.] *From author's summary.*

853. RÜHM, W. Beeinflussung der Parasitenfauna der kleinen Fichtenblattwespe *Pristiphora abietina* Christ durch eine chemische Bekämpfung. **[The effect of chemical control of *P. abietina* on its parasites.]** *Repr.* from *Verhandlungen des IV. Internationalen Pflanzenschutz-Kongresses Hamburg 1957* Vol. 1, 1959 (979–83). [G.]

Treatment of heavily infested Spruce plantations and older stands in Schleswig-Holstein with BHC fog or dust at the end of a larval feeding period gave no lasting control. In the second year after treatment, damage was again heavy. This is attributed to invasion, survival of pupae, and, chiefly, to destruction of parasites. The univoltine larval parasite *Scopiorus flavicauda* took two feeding seasons to reach its former numbers and the multivoltine pupal parasites *Stylocryptus erythrogaster* and *Microcryptus galactinus*, three. Earlier treatment might reduce parasite mortality, but the prospects of chemical control are considered poor, and natural control, with average parasitization rates of 20–25% healthy parasites is also insufficient to prevent injurious epidemics of long duration. Conversion to other species is recommended.

854. BOHART, R. M., and CAMPOS, L. E. **A review of the genus *Omalus* Panzer in North America (Hymenoptera, Chrysididae).** *Ann. Ent. Soc. Amer.* 53 (2), 1960 (235–50). 15 refs. O.R.S.

Discusses, with a key to 17 species found in America north of Mexico, the biology and systematics of these parasites of wood-inhabiting sphecids and bees (particularly twig-nesting pemphredonids).

Diptera

855. EATON, C. B., and YUILL, J. S. **Gouty pitch midge [*Retinodiplosis inopis*].** *For. Pest Leafl. U.S. For. Serv.* No. 46, 1960. pp. 8. 3 refs.

Nomenclature, identification, principal hosts, injuries, life history, habits, distribution and control (including parasites). No chemical control methods have been developed. For Ponderosa Pine (on which the resin midge has only recently been identified as *R. inopis*) selection of non-susceptible types is recommended [cf. *F.A.* 7 No. 1420].

459. Other Animals

See also Nos. 75, 447.

856. MORENO, A. F., and TURICA, A. Contribución al conocimiento de los nemátodos perjudiciales para forestales. **[Nematodes harmful to forest species.]** *Idia* No. 147, 1960 (27–31). [Span.] C.G.B.

Experiments were made during 1951–55 by the Laboratorio de Fitopatología del Delta in the artificial infestation of young trees of the species most commonly grown in the Paraná Delta with *Meloidogyne incognita*, to test their natural resistance. *Salix alba* var. *caerulea* proved very susceptible, especially when grown on high ground. The period of greatest activity of *M. incognita* was October–May, when the temperature is highest. Hybrid Willows proved less susceptible. The hybrid Willow 198, *Quercus robur*, and *Eucalyptus alba* may be considered practically immune. Susceptible species should not be grown on high ground but are suitable for low land, liable to flooding. The type of damage inflicted and distribution of various nematode species in Argentina are also dealt with.

857. **[Nematode control.]** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1959*, 1960 (25).

Nemagon, a nematocide that can be safely applied round living plants, reduced the population of *Tylenchorhynchus claytoni* temporarily at dosages of ½ gal./acre, but > 5 gal./acre were necessary to hold the population below damaging levels.

46. Damage by Man

See also Nos. 70, 333.

858. PROKOP'EV, M. N. O sohranjaemosti podrosta eli pri trelevke lesa s kronami. **[Survival of Spruce advance growth when skidding trees with crowns.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (19–24). [Russ.]

Felling-and-skidding machines were used in whole-tree extraction in the *Piceetum myrtillosum*, site class III, age class V, where the advance growth (a.g.) numbered 8000–15,000/ha., 70–80% of it $\leqslant$ 0·5 m. high. During the operations, 30–40% of the a.g. was destroyed. This damage is analysed by type of injury and size classes affected. Whole-tree skidding with the butts resting on the tractor, causes less damage to a.g. than tree-length skidding, and obviates the need for burning to clean up the felling site.

859. PROTOPOPOV, V. V. Vlijanie mehanizirovannyh lesozagotovok na estestvennoe vozobnovlenie eli. **[Influence of mechanized logging on natural regeneration of Spruce.]** *Trud. Inst. Les.* No. 40, 1959 (53–94). 29 refs. [Russ.russ.]

Studies were made in the Kostroma region in the *Piceetum myrtillosum*, *P. polytrichosum* and *P. oxalidosum*. Extensive tabulated data are given on the damage done to Spruce advance growth during

the various phases of mechanized logging operations with mainly winch skidding. The effect of mechanized logging on the soil, litter and ground vegetation is also studied in some detail, and data are given on the air temperatures and natural regeneration on areas subjected to 'concentrated' clear fellings. Preparatory work destroys 8–10% of the Spruce advance growth; felling with electric saws destroys some 32–54% of the remainder; full-tree skidding by winch destroys 56–70% of the remainder; burning logging debris in heaps destroys 3% of the remainder; so that only 14–30% of the original advance growth survives, very irregularly distributed over the area. Some 50% (by weight) of the ground vegetation is also destroyed by full-tree winch skidding. Recommendations are made with a view to preserving as much of this advance growth as possible, and so preventing succession by Birch and Aspen.

48. Injuries Due to Unknown or Complex Causes

See also Nos. 166, 321, 497, 649, 707, 1169.

860. Micov, D. Nepoznato oboljenje borovih sadnica. [**An unknown disease of Pine seedlings.**] *Šumarstvo* 12 (11/12), 1959 (595–6). [Serb.f.]

Failure of terminal buds to develop, and subsequent death of the plant, have been noted since 1954 in *Pinus laricio* and *P. halepensis* plantations. The condition is thought to be caused by a disease as yet unidentified.

861. Dochinger, L. S. **Occurrence of the chlorotic dwarf disease in some Ohio White Pine plantations.** *Sta. Note Cent. St. For. Exp. Sta.* No. 141, 1960. pp. 2.

In 1959, out of 25,880 *Pinus strobus* plants examined in 43 plantations, 22,702 were healthy, 1622 doubtful, and 1556 diseased. In 3- to 15-year plantations (the age range in which infection is normally found), ca. 7% of trees were diseased. Most diseased trees were found in 3- to 11-year plantations. In all plantations, incidence of the disease was either high or low, and may be influenced by certain management practices or plant/environment relationships.

862. Jacobs, R. D. **Top-dying of Yellow Birch, Upper Michigan 1955–59.** *Tech. Note Lake St. For. Exp. Sta.* No. 585, 1960. pp. 2.

[Cf. *F.A.* 20 No. 832.] The % of top-dying trees reached a new peak in 1959 after two years of improvement. Tabulated observations support earlier conclusions that top-dying is related to stand density, the % of injured trees being greatest in heavily cut and least in uncut stands. The cause of top-dying is still undetermined. A prolonged high water-table was again noted in spring 1959 and observation of water-table levels is being continued.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

521. Diameter (Girth) and Sectional Area

See also Nos. 869, 881.

863. Nicholson, D. I. **Height, girth relationships of young Dipterocarps.** *Malay. Forester* 23 (2), 1960 (135–6).

An endeavour has been made to determine such a relationship in order that height measurements could be converted to girths for comparison with later girth measurements and also for the calculation of a mean girth for research plots in which most trees are large enough to be girthed but a few small trees must be measured by height alone. The species measured, with the numbers of trees of each, were as follows: *Parashorea malaanonan* (176), *Shorea leptoclados* (202), *S. leprosula* (397), *S. parvifolia* (181), *S. pauciflora* (67), *S. macroptera* (90), *S. smithiana* (38), *S. mecistopteryx* (47), *S. argentifolia* (29), *S.* (*Anthoshorea*) sp. (50), *Dryobalanops lanceolata* (74), and *Dipterocarpus caudiferus* (29). Dominated trees of > 10 ft. showed a consistently smaller girth in most cases, and these are shown separately in the table.

522. Height, Length

See also Nos. 863, 869.

864. Vuokila, Y. Näkökohtia valtapituuden määrittämisestä. [**The determination of dominant height.**] *Metsät. Aikak.* 1960 (6/7), (235–8). [Fi.e.*e.*]

Discusses different methods of determining top height and compares two, based respectively on the 100 trees of greatest d.b.h./ha. and the 10% of the growing stock comprising the largest trees, concluding that the two methods are of equal value.

523. Bark

See also No. 873, 1188.

865. Šikov, K. Izučvanija vărhu količestvoto na elovata kora. [**Investigations on the quantity of bark on Silver Fir.**] *Gorsko Stopanstvo* 13 (6), 1957 (251–6). [Bulg.]

From investigations in Bulgaria on 244 stems, presents two tables, for 10–62 cm. d.b.h. by 2-cm. intervals, showing: (1) the amount of bark (in cu.m., and in % of stem volume o.b.), and (2) bark thickness (in cm., and in %) at 0, $\frac{1}{10}$, $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ of stem height.

866. Panić, Đ. Prilog poznavanju debljine kore kod breze (*Betula verrucosa* Ehrh.). [**The thickness of Birch (*B. verrucosa* Ehrh.) bark.**] *Šumarstvo* 12 (11/12), 1959 (583–94). 4 refs. [Serb.serb.f.]

Measurements were made on Birch stems in 2-cm. diam. classes between 10 and 55 cm. d.b.h. from the Zlatibor region and the Deliblato sands (tables and graphs of basic data given). Mean single bark thickness at b.h. was 12·36 mm. The relationship

between this bark thickness in mm. (y) and d.b.h. in cm. (x), for stems 10–56 cm. in d.b.h., was found to be: $y = 0{\cdot}394774\,x + 1{\cdot}162455$, and that between bark thickness and total height in m. (h), for trees 7–20 m. high, $y = 0{\cdot}02411\,h^2 - 0{\cdot}197565\,h + 9{\cdot}386998$. The mean value for the relationship between diam. o.b. (D) and diam u.b. (d) at b.h. for trees of 14–56 cm. d.b.h. was: $D/d = 1{\cdot}1000 \pm 0{\cdot}0206$ and for d/D was $0{\cdot}9106 \pm 0{\cdot}0157$. An examination of the mean value of D/d at different heights on individual stems showed a minimum value of 1·0755. The proportion of bark in total stem volume was found to diminish from 17·8 to 11·7% as the d.b.h. increased from 16 to 58 cm., the mean being 15·36%. The mean double thickness of bark on stems of trees aged 2–4 years was 1·0 mm. [Cf. *F.A.* 19 No. 4599.]

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See also Nos. 872–3.

867. HARRIS, J. D., and NASH, A. J. **Girard form class estimation from lower bole measurements on upland White Oak trees in Missouri.** *J. For.* 58 (7), 1960 (534–6). 4 refs.

Estimated Girard form class from two measurements on the lower portion of the tree was tested in two White Oak stands in central Missouri. The best of a number of different combinations of under- and over-bark measurements at various heights above ground, was obtained from measurement u.b. at 6·5 ft. and an o.b. measurement at 2·5 ft. The estimated Girard form class can be obtained from the linear equation $Y = 12{\cdot}44 + 0{\cdot}841\,X$, in which X is form class obtained from the two lower measurements and Y is Girard form class. Individual tree characteristics such as butt swell and short boles may cause wide variations in the relation between the two methods of obtaining form class, but the difference is very low if dominant and co-dominant trees in reasonably well stocked stands are measured. *From authors' summary.*

868. EIĆ, N. Tabele padova promjera od panja do prsne visine. **[Tables of taper from stump to breast height.]** *Šumarstvo* 12 (9/10), 1959 (463–9). [Croat.g.]

Presents tables of taper, in 5 diameter classes, for Silver Fir, Spruce, *Pinus sylvestris*, *P. nigra*, Beech and Oak. Stump measurements were taken at a height of ⅓ of stump diameter at ground level, and d.b.h. was measured at 1.30 m. Taper is expressed in cm. and as a %.

524.3. Volume of Tree Groups and Stands

869. TAKATA, K. **[Studies of the volume estimate by basal area at breast height. (5) Construction of universal diameter-height curve (EHK). (6) Applicable limit of monovariate volume equation in logarithmic expression (local volume equation). (7) On the application of Algan's volume table to Sugi.]** *J. Jap. For. Soc.* 40 (1–3), 1958 (1–6; 58–60; 107–10). 12 refs. [Jap.jap.e.]

[Cf. *F.A.* 20 No. 4975.] For (5), Sugi (*Cryptomeria japonica*) data were used and the curve compared with Näslund's [cf. *F.A.* 9 No. 618].

870. PATRONE, G. Tavola cormometrica del larice di Vezza d'Oglio cresciuto in fustaia coetanea. **[Volume table for even-aged Larch of Vezza d'Oglio (Brescia).]** *Ital. for. mont.* 15 (3), 1960 (125–6). [It.it.f.]

871. LANGDON, O. G. **Volume tables for South Florida Slash Pine (*Pinus elliottii* var. *densa* Little and Dorman).** *Res. Note Stheast. For. Exp. Sta.* No. 120, 1958. pp. 2.

Presents (1) a table of cu. ft. volume o.b., by diameter and total tree height, based on 51 pulpwood-size trees (5–10 in. d.b.h.), and (2) bd. ft. volumes by diameter and (*a*) total tree height, (*b*) merchantable log length, based on 80 sawlog-size trees (10–22 in. d.b.h.). [Cf. *F.A.* 21 No. 807.]

872. BURSTALL, S. W. **Combined taper and volume tables for *Pinus radiata*—New Zealand, 1957: shelterbelts, and for *Pseudotsuga taxifolia*—New Zealand, 1958: all stands.** *Res. Note N.Z. For. Serv.* No. 19, 1959 (1960). pp. 63.

873. MILESCU, I., DECEI, I., and DISSESCU, R. Contribuţii la cunoaşterea formei şi volumului arborilor la stejarul brumăriu (*Quercus pedunculiflora* C. Koch). **[Form and volume of *Q. pedunculiflora*.]** *Rev. Pădurilor* 75 (1), 1960 (12–5). [Rum.russ.g.f.e.]

Gives taper and volume tables and tables of bark thickness and volume for *Q. pedunculiflora* growing in the forest-steppe region of Wallachia.

874. SETH, S. K., and DABRAL, S. N. **General standard volume tables for *Anogeissus pendula* Edgw.** *Indian For. Rec.* (*n.s.*) *Silviculture* 10 (7), 1960 (217–26 + 1 gph.).

Based on 1989 trees measured in Rajasthan.

875. PFEILSTICKER, K.-H. Vorratsfortschreibung. **[Indirect determination of growing stock [by adjusting for changes since the previous enumeration].]** *Allg. Forstzeitschr.* 15 (33), 1960 (453–5). 7 refs. [G.g.]

Describes methods using (*a*) increment cores and (*b*) tables of increment %, to compute present growing stock from that determined for the previous working plan, according to the formula $V_e = (V_a - E_a) + Zf - E_b$, where V_e is the growing stock at the end of a period, V_a the stock at the beginning of a period, E_a the cut for the first half, and E_b that for the second half, and Zf the increment factor for the whole period. Over an area of 190 ha., results of (*a*) were the same as, and those of (*b*) only 2% different from, those of a full enumeration, (*a*) costing about half and (*b*) even less. It is also possible, but rather time-consuming, to compute the present diameter distribution.

524.6. General Surveys of Forest and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also No. 875.

876. [HARRISON, J. B. D., and SPURR, S. H.] **Planning a national forest survey.** FAO, Rome. [1960?] pp. 108. 57 refs. Limited distribution.

Revision by the second author of a study by the first, originally published in 1950. It outlines the principal problems and briefly treats of some of the most modern inventory techniques and discusses their merits and limitations.

877. FRANCIS, D. A. **Interim Report to the Government of the Sudan on forest inventory.** Expanded Technical Assistance Program, FAO, Rome. 1959. pp. 56 + 15 photos, 2 dgms., 3 sample forms, 3 maps, &, 14 stereo pairs of air photos.

Describes the progress made and methods employed in the national forest inventory, and makes recommendations for the future, with particular reference to aerial photography and the interpretation of aerial photographs.

878. ALEMDAĞ, Ş. Türkiyedeki saf ladin meşcerelerinin kuruluşları, ağaç servetleri ve tecessümleri üzerinde bazı müşahadeler. [**Some observations on constitution, volume and increment of pure *Picea orientalis* stands in Turkey.**] *Orm. Araşt. Enst. Derg.* 5 (2), 1959 (65–77). 3 refs. [Turk.e.e.]

Tabulates and graphs data from a sample plot of 1·5 ha. at Trebizond at 1500 m. alt., facing S.W.: 515·3 trees/ha., b.a. 60·3421 sq. m./ha.; stand volume 681·236 cu.m./ha.; annual increment 4·131 cu.m./ha.; mean stand age 130 years; mean stand height 24·9 m.

879. ROVILLAIN, G. Utilisation partielle des méthodes statistiques d'inventaire pour l'aménagement de la forêt domaniale de Walscheid. [**Partial use of statistical methods of inventory for the management of the state forest of Walscheid.**] *Rev. for. franç.* 12 (8/9), 1960 (546–56). [F.]

Describes the use of systematic sampling ($\frac{1}{40}$ of total area) in the revision of a working plan for a forest in the Vosges, where complete enumeration has hitherto been the rule.

880. KUUSELA, K. Koeala-arvioinnin tilastollisen tarkkuuden laskenta. [**Calculation of statistical precision in plot inventory.**] *Metsät. Aikak.* 1960 (6/7), (233–4). [Fi.e.e.]

Presents data showing that, for a total volume S.E. of 5%, stratified sampling, optimum plot allocation, and accurate area calculation of the strata reduce the number of plots needed by ca. $\frac{1}{2}$. The areas of the strata can be estimated by the line method or measured from a forest map or aerial photographs. *From author's summary.*

881. TAKATA, K. [**Studies of the volume estimate by the basal area at breast height (10). Plotless sampling compared with plot sampling in Yoshimuta National Forest.**] *J. Jap. For. Soc.* 41 (2), 1959 (45–57). 7 refs. [Jap.jap.e.e.]

Plot sampling gave a slightly more accurate estimate of vol./ha. than the angle-count method, but the latter was quicker and less costly.

525. Volume by Assortments. Merchantable Volume

See also Nos. 718, 720, 925, 1161.

882. SAZENIEKS, R. [**The structure of the Scots Pine assortments in mixed Pine/Spruce stands of the *Hylocomiosa* site type.**] *Latvijas PSR Zinātņu Akadēmijas Vēstis, Riga* 1959 (7), (165–70). [Russ.?] From *abstr.* in *Holzforschung, Berlin* 14 (2), 1960 (59). [G.] P.R.

The total volume of timber was not influenced by site conditions, but the dimensions and quality were. Stands on sandy soils gave almost twice as many Pine stems of high value as those on loamy soils.

526. Log Measurement. Scaling

883. Mæsels pris- og kubikklave. [**Mæsel's price and volume caliper.**] *Norsk Skogbr.* 6 (11/12), 1960 (408). [Nor.]

The caliper carries scales showing volumes for timber measured at mid-diameter and basic prices for that measured at top diameter. Trial measurements on 1950 logs gave satisfactory results.

527. Solid Volume of Stacked Products (including Converting Factors)

See also No. 1188.

884. MAKKONEN, O. Kuorimattomien 2·4-metristen koivupaperipuiden ja 2-metristen koivupolttorankojen pinotiheysmittauksia. [**Measurements of the stacking density of unbarked 2·4-m. Birch pulpwood and 2-m. Birch fuelwood.**] *Tied., Metsäteho, Helsinki* No. 173, 1960. pp. 8. [Fi.e.e.]

Fresh studies were needed because of recent stricter requirements for straightness in pulpwood logs. The average stacking-density figures (ratio between solid volume and stacked volume) were 0·681 and 0·667 for minimum top diameters of 10 and 8 cm. respectively for pulpwood, and 0·605 and 0·595 respectively for fuelwood. The previous figure for 2-m. pulpwood [see *F.A.* 20 No. 857] was 0·63. It is clear that the stricter quality requirements have affected stacking density. An increase in the number of logs per stacked cu.m., i.e. a decrease in log thickness, decreased stacking density, largely because of the greater number of irregularities in the thinner logs. Stacking density of Birch from tended stands was rather better than that from untended ones. *From author's summary.*

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 326, 397, 524, 667.

885. JÁRÓ, Z. A levélfelület nagysága néhány erdötípusban. [**The leaf area in some forest types.**] *Erdész. Kutatás., Budapest* 6 (3), 1959 (1960), (103–10). [Hu.hu.russ.g.e.]

It has been found possible to estimate the leaf-area of deciduous forest stands from samples of leaf litter, by determining the number and weight of dead leaves and planimetering photocopies of each leaf in the sample. Analysis of samples from 17 stands

showed variation of only ± 2·96% in results. Of the species investigated, Beech showed the largest and Robinia the smallest leaf-area/ha. Shade-tolerant species (with the exception of *Quercus robur*, *Q. sessiliflora* and *Q. pubescens*) generally had a larger leaf-area than light-demanders. The data for Poplar and Robinia showed no correlation between leaf-area and volume increment. For a given species, leaf-area per ha. is higher in older stands than in younger ones, and this applies to light-demanders as well as shade-tolerant species; it also increases with increasing site quality.

54. Assessment of Site Quality

See also Nos. 398, 864, 909, 1294.

886. WECK, J. Klimaindex und forstliches Produktionspotential. Ein weiterer Beitrag zum Problem ihrer Korrelation. **[Climatic index and ideal site class. A further contribution to the problem of their correlation.]** *Forstarchiv* 31 (7), 1960 (101–5). 9 refs. [G.]

Includes a comparison, for 19 German climatic forest regions proposed by the author, of mean and maximum yield data, and his and Patterson's indices. With the former, designed for temperate zones only, and therefore the better fit, a rise of 100 points for a region corresponded to an increase in mean annual yield of 0·69–0·14 cu.m./ha. A new, general, basic formula is proposed. [Cf. *F.A.* 21 No. 4756.]

887. MYERS, C. A., and DEUSEN, J. L. VAN. **Site index of Ponderosa Pine in the Black Hills from soil and topography.** *J. For.* 58 (7), 1960 (548–55). 20 refs.

Equations for estimating site index have been developed for the two major timber-producing areas of the Black Hills and Bear Lodge Mountains. These two areas are: (*a*) crystalline, with soil formed from metamorphic and igneous rocks, and (*b*) limestone, with soil formed wholly or primarily from limestone. A total of 107 ¼-acre plots were examined on both areas, with site index and important soil and topographic characteristics recorded for each plot. In (*a*), site index can be estimated with four easily measured variables: (1) soil depth to the top of the C horizon; (2) distance of sampling point up the slope expressed as % of total slope length; (3) grade or % of slope; and (4) aspect. The S.E. of estimate was about 8% at average site index, 54 ft. Only two of these variables are required to estimate site index in (*b*), viz. (1) and (2). The S.E. of estimate was about 7% at average site index, 58 ft. On both areas, soil depth accounted for most of the variance in site index, while slope position was second in importance. Only in (*a*) did aspect and slope % appear statistically significant. *From authors' summary.*

888. MASHIMO, Y. **[Studies on the physical properties of forest soil and their relation to the growth of Sugi (*Cryptomeria japonica*) and Hinoki (*Chamaecyparis obtusa*).]** *For. Soils Japan For. Exp. Sta., Meguro, Tokyo* No. 11, 1960. pp. 182. 95 refs. [Jap.e.*e.*]

A comprehensive survey, with many graphs and tabulated data, in two parts. (1) Soil moisture, structure and porosity were studied, and the relationships between various other soil factors and permeability were also investigated. A close relationship was found between soil permeability and the structure and characteristics of soils as classified in the systems adopted by Ohmasa. (2) Growth measurements were made of *C. japonica* and *C. obtusa* in 56 stands on 4 forest sites in central Japan. A study of the relationship between their site index and soil conditions indicated that physical soil properties expressed in terms of a permeability and depth index appeared to be most important for the growth of these species.

889. SCHAIRER, E. Untersuchungen über den Nährstoff- und Wasserhaushalt verschiedener Standorts-Einheiten des Wuchsgebiets Neckarland. **[The nutrient and water regimes of various site types in the Neckarland growth region.]** *Mitt. Ver. Forstl. Standortskunde ForstpflZücht.* No. 9, 1960 (48–62). 17 refs. [G.g.]

A pedological supplement to a yield study on the same sites by M. Günther [cf. *F.A.* 18 No. 4425], analysing and comparing 17 profiles from the 7 main site types distinguished. The type best in terms of site-class indices, described as a fresh Beech/Maple forest on fine loam, was also rated best for physical properties affecting the water regime (*a*), though only 4th in nutrient status (*b*), while a periodically dry Oak/Hornbeam type on gypseous keuper, which was poorest for (*a*), was also poorest in site quality, despite ranking 1st–2nd for (*b*). Needs for and possibilities of improving (*a*) and (*b*) are discussed.

890. DAGNELIE, P., HUBERTY, J. P., and NOIRFALISE, A. Recherches sur la productivité des hêtraies des macignos et des marnes du Bas-Luxembourg. **[The productive capacity of the Beech forests of the *macignos* and marls of lower Luxembourg.]** *Bull. Inst. Agron. Gembloux* 28 (1), 1960 (18–32). 12 refs. [F.] E.M.B.

The Middle Lias between Virton (Belgium) and Bettembourg (Luxembourg) is represented by sandstone marl facies known as *macignos*; these are divided into three lithological formations. A survey was made of the species composition and the productive capacity of the Beech forests on these sites [cf. *F.A.* 19 No. 2137], and the results are presented. Although there are statistically significant differences between productive capacity in the different types of Beech forest, they are of relatively small importance. From this point of view these forests are much more homogeneous than those of the central Ardennes.

56. Increment. Development and Structure of Stands

See also Nos. 214, 317, 322–4, 326, 346, 357 *et seq.*, 484–5, 508–12, 515 *et seq.*, 568, 574, 659, 804, 814–5, 878, 924.

891. ŠIMANJUK, A. P., and ŽANET, V. A. Hod rosta možževel'nika obyknovennogo. **[The rate of growth of *Juniperus communis*.]** *Trud. Inst. Les.* No. 37, 1958 (163–70). 6 refs. [Russ.]

Analyses in detail (tables and graphs) the increment of two trees 100 years old from (*a*) the *Pinetum*

myrtillosum, and of one tree 164 years old from (*b*) the *P. myrtilloso-polytrichosum*, all from the Gorky region. Maximum c.a.i. in height, diameter, and volume occur 30–50 years earlier in (*a*) than in (*b*). The possibilities of *J. communis* wood in pencil manufacture are pointed out.

892. BEECHEL, K. **Growth plots on Mountain Home State Forest [Calif.].** *St. For. Note Calif. Div. For.* No. 1, 1960. pp. 4.

Data from remeasurement of plots on cut-over mixed conifers and from one 70-year-old stand of *Sequoia gigantea*, which is making very rapid growth.

893. PARDÉ, J. Contribution à l'étude de la productivité des reboisements de la région du plateau de Millevaches. **[The productivity of the plantations on the Millevaches plateau.]** *Rev. for. franç.* 12 (8/9), 1960 (557–71). 13 refs. [F.]

A study on the same lines as that already made on plantations in the Sologne [cf. *F.A.* 21 No. 2202]. The *landes* of the Millevaches plateau began to be planted in 1930 and the process still continues [cf. *F.A.* 11 No. 268]. Results to date, necessarily provisional, indicate that with proper choice of species a yield of 10–15 cu.m./ha./year from origin to 50 years should be obtained in average plantations, and that good sites should exceed 20 cu.m. Of the exotics tried, Douglas Fir, Sitka Spruce, Japanese Larch and *Abies grandis* have done very well and are making rapid growth, which calls for vigorous thinning. Japanese Larch, in particular, should be kept at wide spacing and felled not later than its 40th year. Douglas and Sitka stands may be denser and allowed to grow to 50 years or more. The behaviour of *A. grandis* is not yet fully understood.

894. KOVAL', I. P. K voprosu o povyšenii produktivnosti dubovyh lesov severo-zapadnogo Kavkaza. **[Increasing the yield of Oak forests of the N.W. Caucasus.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (5–9). 5 refs. [Russ.]

Analysis of tree dimensions, volume, and increment in stands (age classes II and V) of Sessile Oak/Rhododendron, both with and without self-sown Scots Pine, revealed that the presence of the Pine in these Oak forests (chiefly of coppice origin) on brown-podzolic soils significantly increases stand value and yield.

895. TOMAŠEVSKI, S. Odnos prirasta gorskog javora i bukve u g.j. 'Ravna Gora'. **[The relationship between the increment of *Acer pseudoplatanus* and *Fagus sylvatica* in the Ravna Gora management unit.]** *Šum. List* 84 (5/6), 1960 (166–73). [Croat.croat.e.]

Diameter increment of (*a*) *A. pseudoplatanus* was greater than that of (*b*) *F. sylvatica* in small-diameter and less in large-diameter stems, but in general was about the same. The c.a.i. culminated at 50 cm. d.b.h. for (*a*) and 55 for (*b*), trees above these diameters deteriorating in quality. In (*a*), a c.a.i. peak was also noted at 30 cm. d.b.h., coinciding with maximum foliage production. It is recommended that (*a*) should be maintained where it occurs naturally, and favoured at the expense of (*b*) where possible. In Beech/Silver Fir selection forest, (*a*) should be released from (*b*), particularly in the pole stage.

896. BENTES, J. FERNANDES, and VELEZ, J. CAETANO. Quelques éléments sur la production de l'*Eucalyptus globulus* Labill. dans la forêt nationale de Escaroupim. **[Some data on the yield of *E. globulus* in the [Portuguese] national forest of Escaroupim.]** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU*/60–11*a*, 1960. pp. 4. [F.] Limited distribution.

Contains a provisional yield table and some data on the influence of spacing on increment.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also Nos. 116–7, 231, 504, 524, 651, 903.

897. FARRAR, J. L., and ZICHMANIS, H. **The accurate measurement of diameter changes in small stems.** *Annual Ring* 1960 (16–7). 3 refs.

Describes a modification of McCully's method [cf. *F.A.* 13 No. 4102] in which the aluminium discs glued to opposite sides of the stem are replaced by plastic cones, which have a number of advantages, particularly in obviating the need of excessive pressure by the caliper.

898. KUROIWA, K., YOSHINO, R., and TAKAHASHI, G. **[Daily growth curve of *Paulownia*. [II] Variation in the growing season.]** *J. Jap. For. Soc.* 40 (4), 1958 (139–45). 5 refs. [Jap.jap.e.*e.*]

Presents the main findings (for the growing season) based on weekly mirror-dendrometer measurements [see *F.A.* 19 No. 803] made on 2 trees for a year from May 1956.

899. KUROIWA, K. **[Daily growth curve of *Paulownia*. [III] Variation in the dormant season.]** *J. Jap. For. Soc.* 40 (9), 1958 (391–7). 4 refs. [Jap.jap.e.*e.*]

Deals with the changes observed in the dormant season Nov.-March, 1956–57; the data obtained from mirror-dendrometer measurements are compared with those for the growing season.

900. STONECYPHER, R. W., and CECH, F. C. **An efficient method of taking large increment cores.** *J. For.* 58 (8), 1960 (644–5). 2 refs.

Time for taking increment cores was halved by using an electric drill, powered by a trailer-mounted generator, to drive in 8- and 10-mm. borer bits. The bits were removed from the tree by hand and yielded cores of excellent quality.

901. STAGE, A. R. **Computing growth from increment cores with point sampling.** *J. For.* 58 (7), 1960 (531–3). 5 refs.

Discusses the advantages of using the angle-gauge method for selecting trees for increment sampling, and presents a formula for computing the ratio of increment to basal area which allows for changing bark thickness. A procedure for estimating the

proportion of trees to be bored on each plot is also outlined. *From author's summary.*

902. FERGUSON, C. W. **Annual rings in Big Sagebrush (*Artemisia tridentata*).** *Abstr. of thesis*, in *Dissert. Abstr.* 20 (11), 1960 (4225). O.R.S.

A study of ca. 700 stem sections from 7 western states and Lower California, Mexico, showed that the growth ring of *A. tridentata* is sensitive to changes in annual precipitation and the species may reach an age of > 200 years. Ring chronologies follow the same pattern as adjacent tree-ring chronologies, and Sagebush can therefore be used for climatic and ecological studies outside the forested areas.

562. Volume Increment

See also Nos. 322–3, 875.

903. PATRONE, G. Sull'incremento percentuale di massa di una particella coetanea. **[Volume increment per cent of an even-aged compartment.]** *Ital. for. mont.* 15 (3), 1960 (110–1). [It.it.f.]

The volume increment % (p) of an even-aged stand, may be expressed as a function of (e) the 'elasticity of productivity' (the c.a.i./m.a.i. ratio), and it is shown that the value of p for a stand aged t years varies inversely with the value of t and directly with that of e. Since e decreases with increasing age of stand, so also does p. Finally it is shown that p is represented geometrically by the value of the subtangent to the volume curve multiplied by 100.

904. ALEMDAĞ, Ş. Meşcere hacım artımının tayininde Schneider, Pressler ve Meyer me odlarının verdiği neticeler. **[Results obtained by the Schneider, Pressler and Meyer methods of determining stand volume increment.]** *Orm. Araşt. Enst. Derg.* 5 (1), 1959 (56–69). 8 refs. [Turk.e.*e.*]

Compares the three methods in a Scots Pine/Austrian Pine stand, and a Fir/Beech/Scots Pine stand. The methods gave different results but it is not yet known which is the most accurate.

905. LEMKE, J. Badania nad metodą oznaczania bieżącego przyrostu miąższości drzewostanu. **[Investigation on a method of determining the current volume increment of stands.]** *Sylwan* 104 (3), 1960 (1–19). 10 refs. [Pol.russ.e.]

The accuracy of Borowski's method [see *F.A.* 16 No. 3274] depends largely on the accuracy in determining mean d.b.h. increment. Investigations were made on the variations in d.b.h. increment in four even-aged stands of Scots Pine (26, 40, 65 and 90 years old), with a view to improving the selection of sample trees so as to find trees having d.b.h. increment as close as possible to the mean. Mean d.b.h. increment generally increased with increasing tree diameter. The greatest d.b.h. increment, whether for particular diameter classes or for the whole stands, was found in the youngest stands. Differences between the d.b.h. increment of particular diam. classes and that of the whole stand were large in younger stands, and decreased with increasing age. The scatter in stand d.b.h. increment is very considerable and decreases only slightly with age. *From author's summary.*

906. PLAVŠIĆ, M., and KLEPAC, D. Utvrđivanje prirasta po kontrolnoj metodi na pokusnim plohama gospodarske jedinice 'Posavske šume' u Šumariji Lipovljani. **[The determination of volume increment by the '*méthode du contrôle*' on experimental plots in the 'Posavske šume' management unit, Lipovljani forest district.]** *Šum. List* 83 (8/9), 1959 (257–70). 4 refs. [Croat.e.]

Presents the results of investigations in sample plots that had received a moderate crown thinning, in 71- to 92-year mixed lowland forest (chiefly *Quercus robur, Fraxinus angustifolia, Ulmus campestris, Carpinus betulus* and *Alnus glutinosa*). Total volume increment, as calculated by the *méthode du contrôle* (enumerations made in 1950 and 1955) was 11·2–12·1 cu.m./ha. Increment for *Q. robur* alone was 8·4–10·9 cu.m./ha. On one plot the increment of upper-storey *Q. robur* was determined as 10·88 cu.m./ha. by the *méthode du contrôle* vs. 8·3–9·8 cu.m./ha. when calculated from increment cores by the methods of Hufnagel, Meyer and Klepac. On the basis of their results, the authors recommend moderate crown thinning for this type of stand, where the Oak has higher volume and value increments than the associated species.

566. Yield Tables and Their Construction

See also Nos. 304, 896.

907. TRIFUNOVIĆ, D. Racionalni metod izrade tablica prinosa i prirasta za jednodobne sastojine kratke ophodnje. **[A rational method of making yield and increment tables for even-aged stands of short rotation.]** *Šumarstvo* 13 (1/2), 1960 (15–28). 15 refs. [Serb.f.]

The method, based on stand age, mean diameter, mean height, and number of stems/ha., is described in detail and illustrated for *Populus* × *serotina* aged 5–35.

908. KAKIHARA, M. **[Studies on the production of Larch (*Larix kaempferi* Sarg.) forest in Kyushu District. (1) Preparation of the stand volume yield table.]** *Rep. Kyushu Univ. For.* No. 13, 1959 (1–18). 11 refs. [Jap.jap.e.]

Presents a volume yield table designed to provide a guide for future management.

569. Increment; Development and Structure of Stands: Miscellaneous

See No. 115.

58. Surveying and Mapping. Aerial Survey

See also No. 877.

909. DUCHAUFOUR, P. Stations, types d'humus et groupements écologiques. **[Sites, humus types, and ecological grouping.]** *Rev. for. franç.* 12 (7), 1960 (484–94). 8 refs. [F.]

Expounds at length a system of site mapping based on humus types (mull, mor, and moder), soil moisture, and vegetation types. A table of such types for N.E. France is given, arranged in one direction in order of increasing soil moisture, and in the other in order of decreasing base content of soils. [Cf. *F.A.* 20 No. 2186.]

910. MAYER, E. Neue Wege der Herstellung von Forstkarten. **[Modern methods for the making of forest maps.]** *Allg. Forstztg.* 71 (17/18), 1960: *Suppl.* (*Informationsdienst* No. 36). pp. 2. [G.]

Discusses the merits (dimensional stability etc.) of various papers and plastic foils, and of methods of inscribing data on them, including techniques of cutting into special coatings on such foils, the tools for the purpose, etc.

911. SMITH, J. W. **Contour interpolator.** *J. For.* 58 (7), 1960 (565–6).

Describes a device for graphical solution of contour point locations between two points of known elevation on a map, and its use in interpolating contours.

912. MEYER, M. P. **Transfer of points from old to new aerial photographs.** *Minn. For. Note* No. 93, 1960. pp. 2.

Describes and illustrates a simple but accurate procedure for transferring fixed points such as compartment corners or permanent plots from old to new photographs, for use e.g. when vegetation cover has been considerably altered by logging.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

61. Forest Management: General, Theory and Principles

See Nos. 317, 584, 875, 1248, 1294.

62. Methods of Management. Working Plans. Annual or Periodic Yield. Yield Regulation

913. KIRSCHFELD, P. Die neue Forsteinrichtungsdienstanweisung in Baden-Württemberg. **[The new service instructions for forest management in Baden-Württemberg.]** *Allg. Forstzeitschr.* 15 (30), 1960 (417–21). 17 refs. [G.]

Briefly discusses provisions regarding objects of management, determination and description of the characteristics of stands and sites, planning, statistics, periodic reviews, the collaboration between a central management office and the local officer in charge, etc.

914. ILVESSALO, Y. Suomen metsien hakkuumahdollisuudet metsävarojen kehittämiseen tähtäävän hakkuusuunnitteen valossa. **[Cutting possibilities of the forests of Finland in the light of allowable cut, aiming at the development of forest resources.]** *Commun. Inst. For. Fenn.* 51 (9), 1959. pp. 44. [Fi.e.*e.*]

A fuller version of a paper already published elsewhere [see *F.A.* 21 No. 870].

915. KLEPAC, D. Nekoliko metoda za određivanje etata u jelovim prebornim šumama. **[Some methods of determining yield in *Abies alba* selection forests.]** *Šum. List* 83 (12), 1959 (426–36). 7 refs. [Croat.f.]

Descriptions of 4 methods, illustrated by data from a 320·1-ha. area of forest near Zagreb consisting of 75% Fir and Spruce and 25% Beech, by volume.

64. Forestry as a Business: General

See also Nos. 573, 931, 1288.

916. **Tree characteristics and wood quality in relation to logging and forest management.** *Pulp Paper Mag. Can.* 61 (8), 1960 (133 . . . 172). Many refs.

A symposium containing the following papers: The influence of tree characteristics on logging efficiency and cost (*C. R. Silversides*) [trees of uniform size, relatively large mean diameter, tall, with a minimum of taper, relatively small crowns, and high density, and free from defect and decay, result in optimum logging efficiency]; Genetics as a factor in quality control (*M. J. Holst*); Defects in the second-growth forest and their causes (*L. T. White* and *J. T. Basham*); The interrelation and compatibility of silviculture and logging (*F. G. Simmons*); Plantation versus natural forests in relation to such quality factors as yield, branchiness, taper, disease incidence and uniformity of quality (*A. P. Leslie*) [with particular reference to exotic conifer plantations in Britain, New Zealand and S. Africa]; Variation in growth, regeneration and quality of Balsam Fir, Jack Pine and Spruce within their natural ranges (*G. H. B. Bedell*) [pointing out several lines of research needed if operations are to be on a sustained-yield basis with high-quality, low-cost wood].

917. SAKAGUCHI, Y., and SHIOYA, T. **[Research of forest plantation and profit-sharing afforestation at Misakubo town in Tenryu interior.]** *Rep. Kyushu Univ. For.* No. 13, 1959 (47–81). [Jap.]

Results are given in a series of 28 tables.

65. Special Business Problems of Timber-Growing

See also Nos. 369, 371–2, 378, 384, 515, 643, 697, 1290.

918. VVEDENSKIJ, E. M. Zatraty na vyraščivanie lesnyh kul'tur. **[Costs in raising plantations.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 37, 1958 (191–210). [Russ.]

Analyses costs of soil preparation and planting in several mechanized leskhozes.

919. MARTIN BOLAÑOS, M. Observaciones en la multiplicación de eucaliptos por administración directa y a contrata. **[The planting of Eucalypts directly or by contract.]** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/60–3a.1*, 1960. pp. 4. [Span.] Limited distribution.

Discusses the advantages and disadvantages of contract planting in coastal districts of S.W. Spain, where estates are not very large, and areas to be planted small, with much heath and scrub (chiefly *Erica* spp. and *Arbutus unedo*). It is concluded that in these conditions contract planting is the more economical method.

920. Operaciones de plantación y costos. **[Plantation costs [for Eucalypts in Spain].]** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU/* 60–3*a*, 1960. pp. 2. [Span.] Limited distribution.

921. KOK, A. M. A. Die kweek van hoë gehalte *Pinus radiata* op eerste boniteit groeiplekke in Suid-Afrika. **[Growing high-grade *P. radiata* on sites of the first quality class in South Africa.]** *J. S. Afr. For. Ass.* No. 34, 1960 (23–64). 10 refs. [Afrik.afrik.e.]

In order to determine the economic possibility of producing a 'super-grade' timber (superior to the Grade-I South African Pine timber, which is not equal to the best imported softwood), data were analysed of *P. radiata* from C.C.T. sample plots and permanent sample plots of the Department of Forestry and of sample trees of two small stands > 60 years old. Number of stems per acre, mean d.b.h. and height at various ages, and growth trends are given in tables and graphs. Diameter increment of the old trees was found to be above that shown by Craib [see *F.A.* 1 pp. 165–6] for first-quality sites. No record is available for planting, thinning etc., but the probable number of stems per acre at various ages is shown in a table, and a suggested thinning schedule is given for Pine on first-quality sites, planted at 10 × 10 ft. (400 per acre), starting with heavy thinning (44%) at 4 years, before competition becomes heavy, and continuing with frequent light thinnings to leave 80 stems/acre for trees to be felled at 35–37 years and 65/acre for those to be felled at 38–43 years. Specifications are given for the 'super-grade' log expected from pruning to at least 22 ft. and the thinning schedule given above. Financial calculations are made and tabulated data given, showing rate of interest at different ages.

922. DELVAUX, J. Influence de l'intensité des éclaircies sur le rapport financier des plantations forestières. **[The influence of intensity of thinning on the financial return of forest plantations.]** *Bull. Soc. For. Belg.* 67 (6), 1960 (238–45). [F.]

By way of reinforcing Hiley's advocacy of heavy thinnings on the South African scale for European conditions [cf. *F.A.* 20 No. 4353], the author analyses the returns from pure Spruce quality-I plantations on rotations of (*a*) 120 and (*b*) 50 years, subjected to (1) moderate and (2) heavy thinnings, and concludes that (*a*2) and (*b*2) give respectively 28% and 10% more financial return than (*a*1) and (*b*1).

923. GRAH, R. F. **Effects of initial stocking on financial return from young-growth Douglas-Fir.** *Hilgardia, Berkeley, Calif.* 29 (14), 1960 (613–79). 41 refs. [Cf. *F.A.* 20 No. 2203.]

924. PONCELET, J. Les boisements de douglas en Ardenne. **[The Douglas Fir plantations of the Ardennes.]** *Bull. Soc. For. Belg.* 67 (7), 1960 (257–78). 6 refs. [F.]

Describes the suitable sites, nursery practice and plantation technique, and makes a comparison of costs, yields and financial returns for 45-year plantations of Norway Spruce and Douglas Fir, to the advantage of the latter.

925. LEHTPERE, R. **Utilization of mature Douglas Fir from North Wood, Dartington.** *Quart. J. For.* 54 (3), 1960 (221–9).

In experiments in which 32 trees (57 years old, total volume 2186 H. ft. o.b. to a 3-in. top) were felled and sawn, efforts were made to establish the standing value of mature Douglas Fir in this wood; the outturn of sawn materials; the net value of trees of ca. 50 and 100 H. ft., and of the bottom, middle and top log. Detailed results are tabulated.

926. GIURGIU, V. Taxele forestiere, rolul şi metoda de calcul a acestora. **[Stumpage prices, their role and the method of computing them.]** *Rev. Pădurilor* 75 (1), 1960 (7–12). [Rum.russ.g.f.e.]

Emphasizes the importance of stumpage prices in the socialist forest economy, critically analyses the system prevailing in Rumania and the method of computation, and concludes that a completely new system of prices is required, correlating them with species, assortments, transport distances, classes of accessibility, and silvicultural treatments.

927. WOBST, A. Fortschreibung der Einheitswerte des forstwirtschaftlichen Vermögens. **[Adjustments of unit values [as a basis of assessment for rates, taxes, etc.] of forest properties.]** *Forst- u. Holzw.* 15 (11), 1960 (218–20). 2 refs. [G.]

Criticizes, on the basis of an actual revaluation, the principles underlying the last general valuation of 1935 and individual later adjustments thereof. It is suggested that the method used, which seeks to assess yield capacity by an age-class system, overvalues both estates having an excess of young stands and those whose mean age has increased because exploitation has taken the form of intermediate or selection-type fellings rather than final (clear) fellings.

928. GRABENSTEDT. Erträge aus älteren Pappelanpflanzungen als Hinweis für zukünftigen Anbau. **[Yields from old Poplar plantations as a pointer for future planting.]** *Forst- u. Holzw.* 15 (11), 1960 (213–4). [G.]

Analyses the money and assortment yields from (*a*) 25 Poplars (mainly *P.* × *marilandica*) in a pure stand felled in 1960 at 40 years of age, and (*b*) two Poplars, 45 years old, that had been planted as an admixture of single trees in a young Beech stand. Gross financial returns per tree averaged DM.88·78 in (*a*), and DM. 421·51 in (*b*).

929. GLÄSER, H. Produktionssteigerung in der Forstwirtschaft durch Extensivierung. **[Increasing productivity in forestry by less intensive management.]** *Holz-Zbl.* 86 (97), 1960 (1347–9). [G.]

Argues that under present and foreseeable conditions of the market for forest products on the one hand, and of labour on the other, a lowering of standards of silviculture (longer thinning cycles, concentration on a few easily regenerated species etc.) and of logging (e.g. simplified sorting) will be economically preferable to increased mechanization and other intensive working.

66. Costing of Logging Operations

See also Nos. 591, 916, 929, 1188.

930. MØLBACH-PETERSEN, Ø. Studier i skogbrukets transportøkonomi. **[Studies on the economics of timber transport.]** *Medd. Norske Skogforsøksv.* 16 (3), No. 55, 1960 (157–223). 21 refs. [Nor.nor.e.*e.*]

Includes discussion of: the theory of costs, especially in timber transport, using the method of distribution and the terminology of Sundberg [see *F.A.* 17 No. 1644]; the use of cost functions, graphs and tables in determining road spacing; the use of functions and tables in comparing transport by lorry and tractor, in calculating the direct and indirect costs in a large forest enterprise and in selecting the direction of transport and laying out the road network on hilly terrain; and road standards in relation to costs, terrain and amount of use.

67. Assessment of Financial Results; Book-keeping and Accountancy; Business Statistics; Short-Term Planning and Financing

931. ABETZ, K. Forstliche Kennzahlen der Betriebsstatistik gemischter land- und forstwirtschaftlicher Betriebe. **[Forestry heads for the business statistics of mixed agricultural and forestry enterprises.]** *Allg. Forst- u. Jagdztg.* 131 (7), 1960 (154–9). [G.e.]

Outlines a proposed standardized system for the collection and analysis of information on farm woodlands, containing 77 heads for description, increment, cut, etc., prices, labour, and financial accounting.

932. STRIDSBERG, E. Investeringsbehovet i norsk skogbruk. **[Investment requirements in Norwegian forestry.]** *Norsk Skogbr.* 6 (15/16), 1960 (489–92, 518). [Nor.]

Discusses the report of an investment committee appointed by the Norsk Forstmannsforening and, in particular, the calculating techniques used.

68. Administration and Organization of Forest Enterprises

683. Office Organization

933. Bürorationalisierung. **[Rationalization of office work.]** *Allg. Forstzeitschr.* 15 (28), 1960 (389–403). 7 refs. [G.]

A special number, including articles by *E. G. Strehlke*, advocating the employment of separate forest secretaries to relieve district officers, and special training courses for them, *F. Oetting* on calculating machines, *G. K. H. Stolz* on filing systems, *E. Dollenbacher* on forms and their lay-out, and *Rothkirch-Trach* on punched cards [cf. *F.A.* 19 No. 3337].

684. Labour Management

See also Nos. 583, 617, 919.

934. WEATHERBY, H. **Forests, nurseries, logging and prison.** *Timber of Canada* 21 (8), 1960 (59–63).

[Cf. *F.A.* 18 No. 3244.] An account of the use of prison labour in logging and nursery operations in British Columbia, the selected prisoners living in camps (with guards). The general opinion is that the scheme is practicable and profitable to all concerned.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE FOREST PRODUCTS INDUSTRIES

71. Marketing of Forest Products: General

See Nos. 547, 573, 1256

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also Nos. 555, 1055, 1177, 1230, 1250, 1254–5.

935. **Year book of timber statistics 1959.** Timber Trade Federation of the United Kingdom, London. 1960. pp. 20. P.R.

Covers U.K. imports, production, stocks, and consumption.

936. REURINK, C. H. De plaats van het inlandse hout in het Nederlandse houtverbruik. **[The part played by home-grown timber in timber consumption in the Netherlands.]** *Ned. Bosb. Tijdschr.* 32 (8), 1960 (283–9). [Du.e.]

Presents numerical data for home production and imports of different timber assortments.

937. **Statistics on tropical timber 1958. Imports by OEEC member countries. Production and exports by overseas territories.** Organisation for European Economic Co-operation, Paris. 1960. pp. 102. [E.F.] Price 6*s.*

Part I gives imports by member countries, (*a*) by provenance, (*b*) by species. Part II gives production and exports from British, French, Belgian, Netherlands, and Spanish overseas territories.

938. FERREIRINHA, M. P. O comércio mundial de madeiras tropicais africanas. **[World trade in tropical African timbers.]** *Estud. Ensaios e Docum. Junta Invest. Ultramar, Lisboa* No. 60, 1959. pp. 126 + 3 tbls. 14 refs. [Port.f.e.]

(1) Presents and discusses figures for exports from tropical African countries, covering generally the years 1956–57, but in some cases (notably Guinea, Angola and Mozambique) covering the whole history of the export market. (2) Reviews the main consumer markets with particular reference to Portugal. (3) Discusses the present situation. A list of the names of the most important timbers is included.

75. Trade Customs and Usages

939. MAUZ, A. Die forstlichen Verkaufs- und Zahlungsbedingungen in Frankreich im Vergleich mit denen der badisch-württembergischen Staatsforstverwaltung. **[Conditions of forest sale and settlement compared with those of the state forests in Baden-Württemberg.]** *Holz-Zbl.* 86 (106), 1960 (1461–2). [G.]

Discusses methods (auction, tender, etc.), additions to the price, warranties, security to be offered

by the buyer, transfer of property and risk, terms of payment, including interest and discount, removal of wood from the forest, etc.

78. Economics of Transport

See also Nos. 930, 1074, 1229.

940. NORDQUIST, M. Bidrag till kännedomen om kostnads- och omkostnads-fördelningarna vid allmän flottning. **[The distribution of costs and expenses in floating.]** *Norrlands SkogsvFörb.Tidskr.* 1959 (3), (253–82); 1960 (1; 2), (19–66; 157–85). [Sw.]

Comprises a historical survey, citing the relevant laws and regulations since the eighteenth century, in detail for Sweden and more briefly for Norway and Finland, followed by detailed studies of the grouping and distribution of costs of floating and sorting and factors affecting them.

79. Economics of the Forest Products Industries

See also Nos. 947, 1071, 1086, 1229.

941. MASSEY, R. W., JR. **A history of the lumber industry in Alabama and West Florida, 1880–1914.** *Abstr. of thesis*, in *Dissert. Abstr.* 20 (11), 1960 (4385–6). O.R.S.

942. WORLEY, D. P. **Local benefits from timber industry expansion.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 172, 1960. pp. 17.

Demonstrates, by comparison of figures of costs and returns for various production stages and processes, obtained from 50 successful forest product manufacturers in E. Kentucky, that the further manufacture is carried, the greater the product value and hence the benefit to the community.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also No. 1230.

943. MUNZ, W. Die Auswertung des Fachschrifttums. **[The evaluation of technical literature.]** *Holztechnik* 40 (8), 1960 (348–9). [G.] P.R.

A discussion of classification and card indexing (including punched cards) of woodworking literature, for use in woodworking factories.

944. 6. Holztagung der DGfH in Essen am 29. und 30. Oktober 1958. **[The 6th conference of the German Society for Wood Research, Essen, 29–30 Oct. 1958.]** *Ber. Dtsch. Ges. Holzforsch.* No. 1/59, [1959]. pp. 54. [G.] P.R.

Collected conference papers: Beech—practical problems on care and working (*H. Kohler*); Modern tools for woodworking (*J. Lindner*); Synthetic resins as glues and binders in the woodworking industry (*G. Hagen*); Causes of damage on lacquered surfaces of radio cabinets (*F. Kollmann*); Applying and drying lacquer (*E. Eisenmann*); Present position in the practical use of polyester lacquers in the wood industry (*A. Widman* and *A. Schütz*); Investigations on sealing parquet—Mechanical part (*K. Egner*), Chemical part (*W. Leuser*); Problems of rationalization in the wood industry (*A. Schneider*); Investigations on the mechanics of three-layer particle boards (*R. Keylwerth*); Resistance of fibre and particle boards in the tropics—Investigations on resistance to plant and animal pests (*G. Becker*), Investigations of a mechanical and technological nature (*F. Kollmann*); Producing particle boards in mechanized and automated factories (*K. Steiner*).

945. **[Japanese wood industry.]** *Wood Ind., Tokyo* 15 (7), 1960. pp. 51. Many refs. [Jap.] P.R.

Contains general review articles (titles listed in English) on wood technology and the wood industry in Japan. Includes also an original paper by *T. Uemura, et al.* (with English summary) dealing with moisture measurements on Tangile [*Shorea polysperma*] and *Cryptomeria japonica* impregnated with creosote and various chemical solutions.

946. MORRIS, C. O. **Ultrasonics for wood industries.** *Rep. Ore. For. Prod. Res. Cent.* No. *E*-2, 1960. pp. 40. 162 refs.

A study, with diagrams, of the nature and applications of ultrasonic energy, based on extensive literature (classified by subject). Potential applications in wood industries of this highly versatile form of energy are briefly discussed; these include impregnation, penetration, absorption, drying, cutting, heating, testing, particle reduction, extraction, preparation of materials for study, dispersion of particles or glue, fractionation of pulp, agglomeration, and polymerization. *From author's summary.*

81. Wood and Bark: Structure and Properties

810. General Information on Woods

See also Nos. 214–7, 1117.

947. SMITH, H. H. **Wood quality studies to guide Hawaiian forest industries.** *Misc. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 48, 1960. pp. 19.

With a view to the future expansion of the small forest products industry, a study was made of end-use requirements for wood in Hawaii, at present satisfied by imports (98% of which are high-grade Douglas Fir, Redwood or Oak). Summaries of current knowledge and recommendations for future research on the properties and uses of the following promising native or introduced species are presented: *Metrosideros polymorpha*, *Eucalyptus multiflora* (*E. robusta*), *Toona ciliata* var. *australis*, *Fraxinus uhdei*, *Cedrela odorata*, *Sequoia sempervirens*, *Grevillea robusta*, *Alnus nepalensis* and *Flindersia brayleyana*.

948. **Specimen Woods Nos. 295–296.** *Suppls.* to *Wood* 25 (7; 8), 1960. Each pp. 2.

Rose Mahogany (*Dysoxylon fraseranum*); and Rose Maple (*Cryptocarya erythroxylon*).

949. **World timbers. No. 1. English Elm (*Ulmus procera*).** *Suppl.* to *Wood* 25 (9), 1960. pp. 2.

The first of a new series. Illustrates colour and figure (flat-sawn, quarter-sawn, and burr), with notes on the tree, its timber, seasoning, products, mechanical properties, durability, working properties and main uses.

950. ARKWRIGHT, P. **Know your timber: Nos. 75–76.** *Woodwkg. Ind.* 17 (7; 8), 1960 (387; 441). P.R.

San Domingo Boxwood (*Phyllostylon brasiliensis*); and Silver-grey Wood (*Terminalia bialata*).

951. LAMB, G. N. **Foreign woods.** *Wood, Chicago* 65 (6), 1960 (24). P.R.

Camphorwood (*Cinnamomum camphora*) and Coachwood (*Ceratopetalum apetalum*).

952. CARRAPIET, J. B. **Notes on ornamental timbers of Burma.** *Burmese For.* 10 (1), 1960 (37–53). 2 refs.

Notes on distribution, wood properties, and uses of *Chukrasia tabularis, Pentace burmanica, Tectona grandis, Terminalia tomentosa, Pterocarpus macrocarpus, Carapa moluccensis, Albizzia lebbek, A. odoratissima, A. procera, Carallia lucida, Millettia pendula, Cedrela toona, Dalbergia cultrata, D. oliveri, Dolichandrone stipulata, Adina cordifolia, Fagraea fragrans, Amoora wallichii, Gluta tavoyana, Cinnamomum tavoyananum* and *C. inunctum.*

953. BETTS, H. S. **[American woods.]** *Amer. Woods U.S. For. Serv.* Rev. ed. 1960.

Distribution and growth, supply, production, properties and uses of the following: *Pinus lambertiana* (pp. 5; 11 refs.); *Pseudotsuga taxifolia* (pp. 8; 12 refs.); *Taxodium distichum* (pp. 7; 8 refs.); and *Alnus rubra* (pp. 4; 8 refs.).

954. FENSOM, K. G. **The characteristics and significance of Spruce.** Forest Products Laboratory, Vancouver. 1959. pp. 21 + 4 tbls. 24 refs.

Discusses identification, mechanical and chemical properties, uses (including drying and preservation), potential demand, etc., chiefly for *Picea engelmannii* and *P. glauca*, but also *P. sitchensis*, *P. mariana* and *P. rubens.*

955. SACRÉ, E. Analyse physique, mécanique et anatomique de bois de sapin de Douglas, *Pseudotsuga taxifolia* Britt. (*Pseudotsuga douglasii* Carr.), originaires de la région de Saint-Hubert (Domaine de Mirwart). **[Physical, mechanical and anatomical analysis of Douglas Fir wood grown in the St.-Hubert region.]** *Bull. Soc. For. Belg.* 67 (7), 1960 (279–85). 2 refs. [F.]

Gives tabulated data separately for mine timbers and sawtimber based on analysis of 5 logs for each.

956. BANKS, C. H. **Notes on the timber of *Syzygium cordatum* Hochst.** *J. S. Afr. For. Ass.* No. 33, 1959 (49–52). 9 refs.

Describes the tree and the wood, and presents data on sawing and seasoning, structure, mechanical properties, durability and preservative treatment, working properties and uses.

811. Structure, Identification

See also Nos. 185, 1151–2.

957. **List of publications on the growth, structure, and identification of wood.** *Rep. U.S. For. Prod. Lab., Madison* No. 177, 1960. pp. 32. P.R.

The list includes publications giving general information and the results of research by the U.S. Forest Service on the structure and identification of wood; the effect of the cellular structure of wood on its strength, shrinkage, permeability, and other properties; the influence of environmental factors, such as light, soil, moisture, fire, on the quality of the wood produced; the secretions of economic value produced by trees, and their exploitation. Instructions for obtaining publications are given.

958. JUTTE, S. M. **Hardwoods of Netherlands New Guinea I–III.** *Repr.* from *Nova Guinea* 9 (2), 1958 (347–67); 10 (1; 2), 1959 (45–60; 241–78). Many refs. [E.] P.R.

Contains brief botanical descriptions of material collected by P. van Royen in 1954, belonging to about 60 families. Descriptions are given of the wood structure of the angiosperms (obtained by hand lens), and of gymnosperms (obtained separately by stereoscopic microscope).

959. HART, G. **The structure of hardwoods, with terms, definitions and drawings. Part 1: Macroscopic structure.** *Inform. Bull. Timb. Developm. Ass., Lond.* No. *B/IB*/3, 1960. pp. 11 + 12 pp. of drawings.

Written primarily for students and instructors, the report defines growth rings, pores (vessels), wood parenchyma, rays, etc., and includes drawings, together with a list of timbers showing the feature described.

960. COZZO, D. Una particular anomalía anatómica que sirve a la identificación de la madera del 'guatambú' blanco (*Balfourodendron riedelianum* (Engl.) Engl.). **[An anatomical feature for the identification of wood of *B. riedelianum*.]** *Rev. or. argent.* 4 (3), 1960 (81–4). [Span.]

Wood of *B. riedelianum* is characterized by the existence of fine lines, straight or faintly wavy and of a lighter colour than the neighbouring tissue, running obliquely and transversely in either direction at an angle of 30 or 40° to the grain, and occasionally crossing. They are usually 1–2 mm. wide and 3–6 cm. long, though they may be as long as 12 cm. They arise from a deviation in the normal vertical direction of the wood elements, a deviation of the same order as that caused by knots but much smaller in degree. Microscopic examination indicated that the anomaly arises in the daughter cells of the cambium.

961. JAZEWITCH, W. VON; MARIAUX, A. Contribution à l'étude de *Humbertia madagascariensis* Lamk. I. Anatomie de l'écorce. II. Note sur le bois. **[*H. madagascariensis*. I. Bark anatomy. II. Note on the wood.]** *Repr.* from *J. Agr. trop. Bot. appl.* 6 (12), 1959 (609–19). 10 refs. [F.] X.

(I) Describes macroscopic and microscopic features of the bark, with photomicrographs. No resemblance was found to the bark of *Convolvulus*

cneorum or *Datura suaveolens*. (II) Describes the structure of the wood, with photomicrographs, and discusses its mechanical and physical properties. The structure of the wood is closer to that of the Convolvulaceae than to that of the Solanaceae.

811.1. Anatomical Elements and Tissues

See also Nos. 98, 973, 993, 995, 1033, 1156, 1171, 1195.

962. JAYNE, B. A. **Some mechanical properties of wood fibres in tension.** *For. Prod. J.* 10 (6), 1960 (316–22). 15 refs.

[Cf. *F.A.* 21 No. 920.] A supplementary paper, presenting data on the stress/strain relationships of *Abies concolor*, *Picea sitchensis*, *Pinus elliottii*, *P. monticola*, *Sequoia sempervirens*, *Thuja plicata* and *Tsuga heterophylla*. The highest tensile strength measured occurred in latewood of *P. elliottii* (196,000 lb./sq. in. of the material in cross-section, exclusive of lumina).

963. LIESE, W. Die Struktur der Tertiärwand in Tracheiden und Holzfasern. **[The structure of the tertiary wall in tracheids and wood fibres.]** *Holz Roh- u. Werkstoff* 18 (8), 1960 (296–303). 28 refs. [G.g.e.] P.R.

The tertiary walls (t.w.) of tracheids of various species in 7 coniferous genera, and of fibres of various species in 4 broadleaved genera were studied, using air-dry sapwood samples and an electron-microscope. The t.w. consists of a one-layer lamella formed of elementary fibrils (e.f.) and amorphous accompanying substances. The t.w. is 700–800 Å. thick in conifers, but much thinner in broadleaved species. The e.f. are interwoven, i.e. the texture of the t.w. is quite distinct from the parallel texture of the secondary wall. The e.f. may be oriented both right and left to the cell axis. Differences within one species are limited to direction. The e.f. are often arranged in the form of a flat spiral, but this orientation varies considerably within a single species, so that data on the inclination of the e.f. in different species can only represent mean values. The e.f. of the t.w. are mostly oriented differently to the axis of the bordered pit apertures. There is no constant angle between the orientation of the e.f. in the t.w. and the e.f. in the top lamella of the secondary wall. The t.w. differs from the secondary wall in its texture, behaviour with chemicals, and its resistance to enzymatic decomposition, and accordingly the term 'tertiary wall' is preferred for this 'inner layer of the secondary wall'. *From author's summary.*

964. JURBERGS, K. A. **Morphological properties of cotton and wood fibres. II. Slash Pine.** *Tappi* 43 (6), 1960 (561–8). 13 refs. P.R.

Using samples of *Pinus elliottii* from N. Florida, the changes imparted by the chemical isolation processes of wood fibres were followed by electron microscope methods. The surface bundles of cellulose fibrils of holocellulose fibres, and to some extent also of unbleached pulp fibres, are masked by a structureless substance or substances. These bundles are clearly visible on fibres of dissolving-grade pulp, whose surface is covered mainly by the S_1 layer consisting of two systems of fibrillar bundles with a helix angle of 70°. The S_1 layer appears as a loose sleeve-like structure on compression wood and some of the summerwood fibres, has a negative bi-refringence and a thickness of 0·4μ, and restricts fibre swelling with such cellulose solvents as dilute cupriethylenediamine. The parts more resistant to homogeneous acetylation are located deeper in the fibre wall. The different appearance of the lumens of sulphate and sulphite fibres are identified as variables of the pulping processes, measurements of the fibrillar bundles indicating a tighter packing of the fibrils in sulphate fibres. *From author's summary.*

965. BANNAN, M. W. **Cambial behaviour with reference to cell length and ring width in *Thuja occidentalis* L.** *Canad. J. Bot.* 38 (2), 1960 (177–84). 20 refs. O.R.S.

Mature *T. occidentalis* trees of various growth patterns were studied. Although much fluctuation occurred among individuals, there was in general an inverse relationship between cell length and ring width. The variations in frequency of pseudo-transverse divisions in the cambium, however, which might be expected to have a profound influence on cell length because of their involvement in cambial cell multiplication, were not obviously related to the growth rate. The frequency of pseudotransverse divisions in the fusiform initials apparently is geared neither to circumferential expansion nor to number of periclinal divisions in the cambium, but seems to be related simply to linear radial increment. *From author's summary.*

966. SMITH, W. J. **Tracheid length and micellar angle in Hoop Pine (*Araucaria cunninghamii* Ait.). Their variation, relationships and use as indicators in parent tree selection.** *Res. Note Qd. For. Serv.* No. 8, 1959. pp. 61. 44 refs. Limited distribution. P.R.

Discusses the variations in tracheid length (t.l.) and micellar angle (m.a.) within and between 7 even-aged (28·6 years) plantation-grown stems of *A. cunninghamii*, based on their relation to one another and to certain physical properties of the wood. The results (extensively tabulated and graphed) are compared with those reported by other workers for coniferous species with distinct annual rings. The effect of variations in the pattern of incremental growth on t.l. variation within the stem was studied and is compared with variations in the pattern of growth increment in *Pinus elliottii* var. *elliottii*. The use of t.l., m.a., incidence of spiral grain, basic density and longitudinal shrinkage (to be determined from the analysis of small specimens from standing trees) in the selection of superior phenotypes as parent trees for future tree breeding work is discussed. An appraisal is made of the value of top logs of this species for pulp and paper products. *From author's summary.*

967. ELLIOTT, G. K. **The distribution of tracheid length in a single stem of Sitka Spruce.** *J. Inst. Wood Sci.* No. 5, 1960 (38–47). 28 refs.

Examines the pattern of tracheid length variation within a 41-year stem. The variation radially from the pith outwards, and longitudinally from the

stump upwards, followed the expected pattern laid down in Sanio's laws. A comparison between the effect of age and ring width on tracheid length showed that age had the stronger effect. From a 68-year cross-section of another Sitka, age was shown to have a significant effect on tracheid length only in the early years; as the tree matures, the effect of age is superseded by that of ring width. *From author's summary.*

968. MOSKALEVA, V. E. O formirovanii traheid sosny. **[The formation of tracheids in Scots Pine.]** *Trud. Inst. Les.* No. 37, 1958 (254–65). 29 refs. [Russ.]

Discusses literature (mainly Russian and American), and constructs a graph showing radial diameters of tracheids and of their lumina, and wall thickness, in (*a*) early and (*b*) late wood. In (*a*) tracheid formation began at the end of April and finished in mid-June, when tracheids in (*b*) began to form. Wall thickness of tracheids in (*a*) varies little, but in (*b*) considerably.

969. TAMOLANG, F. N., *et al.* **Fibre dimensions of certain Philippine woods, Bamboos, agricultural crops and wastes, and grasses. III.** *Tappi* 43 (6), 1960 (527–34). 13 refs. P.R.

[Cf. *F.A.* 20 No. 2267.] Includes extensive tabulated data on fibre dimensions and derived values determined for whole fibres of a further 47 broad-leaved and 2 coniferous species, and 8 Bamboos, viz. 4 *Bambusa* and 2 *Schizostachyum* spp., *Gigantochloa levis*, and *Phyllostachys nigra.*

970. SCARAMUZZI, G. **Preliminary data on wood fibre dimensions of some Italian grown Eucalypts.** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU*/60–13*a*, 1960. pp. 5 + 4 sets of gphs. 3 refs. [E.] Limited distribution.

Average fibre dimensions are tabulated, and frequency distributions graphed. *Eucalyptus botryoides*, *E. gomphocephala* and *E. maidenii* showed somewhat longer fibres than the other species investigated, and thicker-walled fibres were found in these species. Variability of fibre width was low. *E. maidenii* had a higher fibre-length/fibre-width ratio than the others. The ratios wall-thickness/fibre-radius and wall-thickness/lumen-radius varied markedly, being lowest for *E. resinifera* and highest for *E. gomphocephala.*

971. GHOSH, S. S., and PURKAYASTHA, S. K. **Characteristic arrangement of septate fibres in wood of *Averrhoa* sp.** *Sci. & Cult.* 25 (12), 1960 (690–1). 9 refs. E.M.B.

The presence was observed in *A. carambola* and *A. bilimbi* of light-coloured bands occurring at more or less regular intervals and resembling parenchyma bands, but less well defined. These bands are composed of septate fibres, some of which have a larger diameter, thinner wall and wider lumen than others; such larger fibres are arranged in fairly thick tangential rows. The taxonomic significance of this characteristic is discussed.

972. PURKAYASTHA, S. K. **Growth and development of septate and crystalliferous fibres in some Indian trees.** *Proceedings of the National Institute of Sciences of India, New Delhi* 24*B* (5), 1958 (239–44 + 3 photos). 13 refs. O.R.S.

Material studied was from 5 trees each of *Lagerstroemia speciosa* and *Protium serratum.* The development of septa in both species is described, the number of septa to a fibre being more variable in *L. speciosa.* Crystalliferous fibres are formed in *L. speciosa* at the end of the growing season. The value of the two characters for identification is discussed.

811.2. Special Features and Abnormal Structure

See No. 1156.

811.4. Growth Rings. Early and Late Wood

See Nos. 116, 965, 968, 973, 1032–3.

811.6. Texture, Grain, Figure

See also No. 960.

973. MARIAN, J. E., and STUMBO, D. A. Ein neues Verfahren der Jahrringanalyse und der Rohdichtebestimmung durch Messung des Oberflächengefüges. **[A new method of growth ring analysis and density determination by surface texture measurements.]** *Holz Roh- u. Werkstoff* 18 (8), 1960 (287–96). 34 refs. [G.g.e.] P.R.

[Cf. *F.A.* 20 No. 5194.] Describes the new method, which is based on graphical records obtained with a stylus-trace type of electronic instrument. Cell-cavity and cell-wall dimensions, early- and late-wood distribution within growth rings, porosity, cell-wall substance, and density can be determined by simple measurement and averaging (graphical integration) or by automatic integration by the instrument. Errors due to the human element in such observations are eliminated. The use of the instrument, and possible new applications, are discussed.

974. MAYER-WEGELIN, H., and PIEPER, J. **The figure of veneer wood and its evaluation from log characteristics.** *Transl. For. Prod. Res., Lond.* 1960. pp. 16 + 12 photos. 10 refs. Transl. from *Holz Roh- u. Werkstoff* 17 (8), 1959 (305–12). [See *F.A.* 21 No. 937.] Limited distribution. P.R.

811.7. Phloem; Bark

See also No. 961.

975. SHIGEMATSU, Y. **[Studies on the structure of bark. IV. Microscopic structure of the bark of Pines (2).]** *Sci. Rep. Kyoto Prefect. Univ.* (*Agric.*) No. 11, 1959 (120–5 + 2 plates). 6 refs. [Jap.e.*e.*]

[Cf. *F.A.* 21 No. 2294.] Summarizes the results of studies on the identification of 16 *Pinus* spp. by means of the microscopic structure of their bark, and provides an identification key based on the characters of the outer and inner bark, the components of the bark tissue, and the diameter of the bark elements.

976. NARITA, Y., and ONO, K. **Histological studies on the inner bark of *Broussonetia.*** *Proceedings of the Crop Science Society of Japan, Tokyo* 28, 1959 (115–7). [Jap.] From *abstr.* in *Plant Breed. Abstr.* 30 (3), 1960 (No. 2940).

Data are provided on the thickness of the

epidermis, cork, phelloderm, cortex and fibre layers of 2 varieties of *B. kazinoki* and 4 of *B. papyrifera*.

812. Physical and Mechnical Properties

See also Nos. 585, 957, 961, 1033, 1065, 1151–2.

977. Lukić-Simonić, N. Prilog poznavanju tehničkih svojstava smrče. **[The technical properties of *Picea abies*.]** *Šumarstvo* 13 (3/4), 1960 (201–8). 6 refs. [Serb.f.]

Numerous samples were studied from 5 stems of *Picea abies* from the Stara Planina. It was found that radial and tangential shrinkage were smallest in dense wood with narrow annual rings. Differences in mechanical properties in 4 sections of the stem, at heights above the ground of (*a*) 1·3, (*b*) 3·3, (*c*) 6·3, (*d*) 9·3 m., were examined in relation to ring width and density. Greatest mean compression resistance || was found at (*a*) and smallest at (*d*), increasing with density and closer rings. Tangential static-bending strength was greatest at (*b*), varying directly with density, while radial strength values were slightly lower, being greatest at (*b*) and (*c*), and not necessarily dependent on density. Tangential impact bending strength was greater with rings < 2·5 mm. wide, but no difference was noted between stem sections. The wood was classed as of medium quality, with optimum mechanical properties at ring widths between 1·5 and 2·5 mm. and density of 0·45 g./cu. cm.

978. Kitamura, H. **[Studies on the physical properties of Bamboo (8). On the physical properties of bloomed Bamboo stem.]** *J. Jap. For. Soc.* 40 (9), 1958 (403–6). 15 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 18 No. 4539.] Presents detailed tabulated results of bending, shrinkage, impact-bending, and compression tests made on 3 six- and 4 four-year culms of Bamboo [*Phyllostachys pubescens*?] cut shortly after flowering. Details of the sp.gr. of oven- and air-dried specimens are included.

979. Horvat, I. Prilog poznavanju nekih fizičkih i mehaničkih svojstava bijele i crne topolovine (*Populus alba* L., *Populus nigra* L.). **[Some physical and mechanical properties of the wood of *P. alba* and *P. nigra*.]** *Šum. List* 84 (3/4), 1960 (95–115). 12 refs. [Croat.croat.e.]

Presents the results of comparative investigations on 10 sample trees each of (*a*) *P. alba* and (*b*) *P. nigra* from Lipovljani forest district. Main findings were: (1) mean annual ring width was significantly greater for (*a*) than for (*b*) (3·34 vs. 1·69 mm.); (2) sp.gr. of oven-dry wood was 0·413 for (*a*) and 0·412 for (*b*); (3) radial, tangential and volume shrinkage were 4·4, 8·5, and 13·7 % respectively for (*a*) vs. 4·7, 8·8, and 14·4% for (*b*), but these differences were not significant; (4) the static-bending strength, impact-bending strength, compressive strength and modulus of elasticity were slightly but not significantly higher for (*a*) than for (*b*). The hardness of (*a*), established by Janka's method, was significantly lower than that of (*b*) at 280 vs. 312 kg./sq. cm.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

980. Nambiyar, V. P. N., and Patton, S. **The peroxide theory of the Russel effect in timber.** *J. Inst. Wood Sci.* No. 5, 1960 (48–57).

The formation of latent developable images on photographic plates and films by agents (wood, metals, resins) other than radiant energy was attributed by Russel to the reducing action of H_2O_2. Although the validity of this hypothesis has been established for metals, the cause of the phenomenon in wood has not been determined. Three of the most sensitive tests for H_2O_2 failed to detect its presence in the volatiles released by wood. Further study of trapped volatile materials showed them to contain formaldehyde, which is a good reducing agent. It is concluded that H_2O_2 is not the causative agent of the Russel effect in wood. Although it is not claimed to be the only agent involved, a variety of evidence indicates that formaldehyde is in part responsible for the ability of wood to form a latent image on photographic films. *From authors' summary.*

981. Stevens, W. C. **The thermal expansion of wood.** *Wood* 25 (8), 1960 (328–9).

Describes and illustrates the apparatus used in experiments to determine the coefficient of thermal expansion of moistureless specimens of Beech and Scots Pine. The experiments showed that thermal movements of wood are of small significance, being ca. $\frac{1}{18}$ and $\frac{1}{15}$ that of the corresponding moisture movements in Beech and Pine respectively. *From author's summary.*

982. Simms, D. L., and Roberts, V. E. **Effect of prolonged heating on the subsequent spontaneous ignition of Oak.** *J. Inst. Wood Sci.* No. 5, 1960 (29–37). 3 refs.

Oak specimens were subjected to prolonged heating at 120–180° C. for different periods and then exposed to a range of intensities of radiation. No significant change in the ignition time at a given intensity of radiation was found, but the minimum intensity at which ignition was just possible was progressively raised by an amount related to the loss in volatile content of the solid during the preliminary heating. The rate of weight loss of the specimens followed a first-order reaction equation, so that the probable increase in minimum intensity for ignition after preliminary heating for a given time and at a given temperature may be calculated. These experiments provide no evidence for the suggestion that prolonged heating increases the ease with which wood ignites. The volatiles given off during the preliminary heating may be flammable, and may ignite during heating if allowed to accumulate, especially when a subsidiary source of ignition such as a small flame is present. *From authors' summary.*

983. Kollmann, F. Zur Frage des Auftretens exothermer Reaktionen bei Holz. **[Occurrence of exothermic reactions in wood.]** *Holz Roh- u. Werkstoff* 18 (6), 1960 (193–200). 14 refs. [G.g.e.] P.R.

The occurrence of exothermic reactions in heated

wood depends on its chemical composition, and even more on the particular conditions of the heating. Temperatures causing exothermic reactions were found to be generally lower for Beech than for Spruce, because of the higher pentosan content of the Beech. Normally, ignition-point temperatures lie between 220° and 280° C., but under favourable conditions exothermic processes may occur at 150–160°. Tests showed that the temperatures at which exothermic reactions become apparent increased with an increasing content of inert gas in the atmosphere. In pure O_2 there was a considerable drop in the exothermic point; in pure CO_2 the exothermic reaction occurs at a higher temperature than in pure N_2.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 945, 1031, 1044, 1049–50, 1077, 1084, 1148.

984. Kozlik, C. J. **Bibliography of wood-moisture relationships.** Oregon Forest Research Center, Corvallis. 1960. pp. 35.

Lists 365 publications, mostly in English, under 11 headings.

985. Noack, D., and Kleuters, W. Über die Bestimmung des Holzfeuchtigkeitsgehaltes mit Hilfe radioaktiver Isotope (β-Strahlen). **[Determination of wood moisture content using radioactive isotopes (β-rays).]** *Holz Roh- u. Werkstoff* 18 (8), 1960 (304–8). 5 refs. [G.g.e.] P.R.

The suitability of the method was tested with thin veneers. The factors affecting the accuracy of the method were found to be the absorption characteristics of the radioactive source and the experimental apparatus, the wood moisture content, the accuracy of the ratemeter, and the precision with which the width shrinkage of the samples can be determined. Continuous measurements of wood m.c. during drying showed that the drying of samples can be followed with sufficient accuracy by this method.

986. Christensen, G. N. **Kinetics of sorption of water vapour by wood. 1. The effect of sample thickness.** *Aust. J. appl. Sci.* 11 (2), 1960 (295–304). 12 refs. P.R.

[Cf. *F.A.* 21 No. 952.] The rates of sorption (r.s.) by samples of *Eucalyptus regnans*, from 20μ to 3 mm. thick, were measured, in the absence of air. The measurements covered six approximately equal increments in moisture content within the range 0–0·18 g./g., corresponding to 0–0·90 relative vapour pressure. At the lower m.c.'s large differences in r.s. occurred because of the effect of thickness on diffusion. At higher m.c.'s, r.s. for all specimens was similar and was probably controlled not by diffusion but by a different mechanism, thought to be the relaxation of swelling stress. The equilibrium m.c. of the 20-μ samples was higher than that of thicker ones at all relative vapour pressures. This may be attributed to removal of restraints to swelling when the wood fibres were cut longitudinally. *From author's summary.*

987. Sadoh, T. **[The effect of pre-treatment on wood hemicellulose in moisture adsorption.]** *J. Jap. Wood Res. Soc.* 5 (6), 1959 (218–22). 8 refs. [Jap.e.*e.*] P.R.

[Cf. *F.A.* 19 No. 4768.] Describes experiments in which the adsorption isotherm and density of, and the rate of moisture adsorption by, *Fagus crenata* hemicellulose are determined. Adsorption isotherms are presented for samples at 25° C. subjected to repeated desorption/adsorption cycles, with various drying treatments, and also the correlation of the densities of the dry samples with their equilibrium states. It appears that water molecules may penetrate into the wider intermolecular spaces of samples of desorption–equilibrium hemicellulose more easily than into those of adsorption–equilibrium hemicellulose.

988. Sadoh, T. **[Studies on the relations between physical properties and chemical components of wood. On the hygroscopicities of delignified wood.]** *Sci. Rep. Kyoto Prefect. Univ. (Agric.)* No. 11, 1959 (114–9). 12 refs. [Jap.e.*e.*]

Presents the results of experiments on delignified wood meal (*Fagus crenata*) confirming the hypothesis that the moisture sorption of delignified wood is higher than that of the original wood, since lignin is a hydrophobic material. Some effects of delignification on hygroscopicity are discussed.

989. Julio Labate, P. Importancia del equilibrio higroscópico de la madera en relación con su secado y usos. **[Importance of the equilibrium moisture content of wood in relation to its seasoning and use.]** *Foll. téc. for. Adm. Nac. Bosques, B. Aires* No. 6, 1960. pp. 13 + 1 map. 8 refs. [Span.span.]

Briefly reviews climatic conditions throughout Argentina, with a table giving mean r.h., mean temperature and the equilibrium m.c. of seasoned wood in various localities in the provinces of Argentina. Some general information is included on fluctuations in moisture content of different types of timber in use.

990. Ivanov, Ju. M. K voprosu o vzaimodejstvii meždu drevesinoj i vlagoj. **[On the interaction of wood and moisture.]** *Trud. Inst. Les.* No. 37, 1958 (245–53). 12 refs. [Russ.]

Attempts to explain why absorption outstrips swelling, in dry wood placed in water [cf. *F.A.* 15 No. 4041]. Experiments made with mixtures of water and ethanol showed that absorption decreased with decreasing surface tension, i.e. with increasing molar fractions (m.f.) of alcohol. With m.f. of alcohol $< 0{\cdot}008$, absorption falls by almost 10%, becomes almost stable from 0·02 to 0·04 m.f., and then falls away in a normal curve. Small concentrations of ethanol in water appear to act as a surfactant, maximum absorption and minimum surface tension occurring at 0·02–0·04 m.f.

991. Perkitny, T., Stefaniak, J., and Dulski, L. Wpływ naprężeń rozciągających na pęcznienie i kurczenie się drewna. **[The effect of tensile stresses on swelling and shrinkage of wood.]** *Prace Inst. Tech. Drewna* 5 (1), 1958 (18–36). 3 refs. [Pol.pol.russ.e.] P.R.

Studies the influence of tensile stresses on (1) the

swelling, and (2) shrinkage, of Pine wood [cf. *F.A.* 19 No. 4773]. (1) Oven-dried 5 × 5 × 90 mm. specimens were immersed in water at 20° C. and subjected to tensile stress. Results indicated that the swelling rate for specimens loaded tangentially under max. tensile stress (6 kg./sq. cm.) was ca. 33% greater than for those loaded radially under max. tensile stress (15 kg./sq. cm.), and ca. 81% greater than for those free of load. (2) Wet specimens of similar dimensions were dried, under various tensile stresses, at 105°. Max. tensile stresses before final drying were ca. 4 kg./sq. cm. and 10 kg./sq. cm. (tangential and radial loading respectively), at which specimens were subject first to tangential and radial extension of 2·7 and 2·6%, and then to tangential and radial shrinkage of 3·0 and 0·6% respectively. Final tangential and radial shrinkages were respectively 67 and 86% lower than the normal for unloaded specimens.

992. PERKITNY, T. Die Druckschwankungen in verschieden vorgepressten und dann starr eingeklammerten Holzkörpern. [**Variations in pressure in wood specimens differently pre-pressed and then rigidly clamped.**] *Holz Roh- u. Werkstoff* 18 (6), 1960 (200–10). 15 refs. [G.g.e.] P.R.

[Cf. *F.A.* 19 Nos. 4772–3.] Specimens of Scots Pine sapwood with an initial height (H) of 3 cm. and initial moisture contents of 0, 5, 10 and 15%, were shortened by ($H-h$) by pressing at 0, 5, 10, 20 and 30 kg./sq. cm., and were then clamped between two pressure plates held at a constant distance h. The specimens were alternately wetted and re-dried to their initial m.c., the pressure which they exerted on the plates being measured continuously. Regardless of whether pressure measurements were started with the wetting or the re-drying cycle, all specimens exerted decreasing pressure in successive cycles in both tangential and radial directions. During re-drying to initial m.c., all specimens showed a steep drop in pressure down to zero. The pressure variations were neither eliminated nor significantly influenced by initial m.c. or initial pressure. *From author's summary.*

993. NAKATO, K. [**On the cause of the anisotropic shrinkage and swelling of wood. XVII, XVIII. On the anisotropic shrinkage of Bamboo (1), (2).**] *Sci. Rep. Kyoto Prefect. Univ.* (*Agric.*) No. 11, 1959 (95–113). 27 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 21 No. 957.] (1) Presents the results of a study made on *Phyllostachys pubescens* and *P. reticulata* to determine: (*a*) the anisotropic shrinkage in transverse section, and (*b*) the shrinkage of vascular bundles and parenchyma in the central cylinder. (2) Presents detailed results of studies made on *P. pubescens* of (*c*) the volumetric proportion of the structural elements, (*d*) the area in transverse section and the ratio of maximum width of a vascular bundle in the radial direction to that in the tangential direction, and (*e*) the various mechanisms affecting tangential vs. radial shrinkage.

994. JENSEN, W., FOGELBERG, B. C., and JOHANSON, M. **Studies on the possibilities of using radioactive tracers to follow the penetration of cooking liquors into wood.** *Pap. ja Puu* 42 (7), 1960 (393–400). 24 refs. [E.e.fi.] P.R.

Penetration of a Ca-base sulphite cooking liquor, containing radioactive Ca^{45}, into sapwood of Spruce, was studied for varying temperature, time, and pressure. Measurements of radioactivity were made on microtome slices of the chips, and autoradiographs taken. It seems that the technique may be of advantage if a detailed study of penetration is needed.

995. YOKOTA, T. **Diffusion of sorption-water through the cell wall of wood.** *J. Jap. Wood Res. Soc.* 5 (4), 1959 (143–9). 21 refs. [E.e.jap.] P.R.

Results of experiments to determine the diffusion rate of water through the cell-walls of *Abies mayriana, Cryptomeria japonica, Quercus crispula* and *Fagus crenata* heartwood, the voids of which were filled with paraffin wax, are presented in graphs and tables. The differential diffusion coefficients of water in the cell-wall increase exponentially with concentration up to a concentration of ca. 0·24 (corresponding to 16% m.c.) in longitudinal, radial and tangential directions. The larger coefficient in the radial than in the tangential direction may be attributable to the diffusion of water through the rays (where it occurs exclusively in one direction). The inverse proportional relationship between penetration through the wood and diffusion through the cell-wall observed for *A. mayriana* and *C. japonica* was attributed to the abundance of pits, which assists penetration but hinders diffusion.

996. TARKOW, H., and STAMM, A. J. **Diffusion through air-filled capillaries of softwoods. Part II. Water vapour.** *For. Prod. J.* 10 (6), 1960 (323–4). 2 refs.

Describes experiments with both water vapour and CO_2 [cf. *F.A.* 21 No. 4894] diffusing through $\frac{1}{32}$-in. radially sliced Sitka Spruce veneer, one face of which was held at 0% r.h., the other at various r.h. values. It was found that when r.h. was low (< 20–30%) the transverse diffusion of water corresponded to values computed for CO_2 diffusion, i.e. diffusion under these circumstances must be almost entirely as water vapour through air-filled capillaries; hence diffusion is determined essentially by the rate of movement through the pores of the pit membranes. At high r.h., the diffusion rate increased owing to the contribution of bound-water diffusion.

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 637, 1032.

997. PHILLIPS, E. W. J. **The beta ray method of determining the density of wood and the proportion of summer wood.** *J. Inst. Wood Sci.* No. 5, 1960 (16–28). 7 refs.

To facilitate density determination on very small selected portions of a wood sample and, in particular, the study of density variation within individual growth rings of increment cores extracted from standing trees, a method was developed in which a collimated beam of β-particles from a Sr^{90} source is projected through the air-dry wood, the density of which is found by measuring the number of particles

absorbed. Determinations made on small Douglas Fir samples by this and by a gravimetric method agreed within 2·5%. Refinements of the β-ray method are discussed. Density variation curves, obtained by scanning the annual rings with the β-ray beam, form the basis of a simple objective method of measuring the proportion of late wood.

998. **Density of the wood of Monterey Pine.** *Extr.* from *Rep. For. Timb. Bur. Aust. 1958*, 1959 (23–4).

The results of a study of *P. radiata*, now completed, are as follows:—(i) The wood density of this species in the Australian Capital Territory varies from one region to another; (ii) no consistent differences in density were found between sites within the same region; (iii) on any one site, density is influenced very little, or not at all, by rate of growth; (iv) density appears to have no significant relation to taper; (v) very large differences in density occur from tree to tree on the same site.

812.7. Strength Properties

See also Nos. 962, 1063–5, 1098, 1141, 1154.

999. KONING-VROLIJK, G. M. C. De sterkte-eigenschappen van doussié en afzelia (apa). **[The strength properties of *Afzelia* spp.]** *Repr.* from *Houtwereld, Netherlands* 20 Dec., 1958. pp. 4. 3 refs. [Du.] P.R.

The material used was similar to that used in a study of seasoning and shrinking [see *F.A.* 20 No. 2290]. Results are given in graphs and tables.

1000. SEKHAR, A. C., and RAWAT, N. S. **A note on mechanical properties of *Prosopis juliflora*.** *Indian For.* 86 (8), 1960 (485–7). 3 refs.

Tabulates the results of tests on a small number of clear specimens of *P. juliflora* taken from two billets, one grown in Poona Division and one in Jodhpur Division. The wood was found to be strong, hard and tough, comparing well with *Tectona grandis* and *P. spicigera*.

1001. RAWAT, B. S., and RANA, G. S. **Mechanical properties of Teak from Andamans.** [*Docum.*] *3rd Sess. FAO Teak Sub-Comm., New Delhi 1960* No. *FAO/TSC*-60/4.10, 1960. pp. 3. Limited distribution.

Gives tabulated results of tests, with comparative data for mainland Teak.

1002. TOTTENHAM, H. **The sustained load strength of timber.** *Res. Rep. Timb. Developm. Ass., Lond.* No. *E/RR*/11, 1960. pp. 9 + 1 gph., 1 dgm. Price 3*s.* 6*d.*

[Cf. *F.A.* 20 No. 5133.] Timber is considered as an ideal viscous elastic medium. Various criteria for breakdown are considered and the Coulomb hypothesis, that breakdown occurs when critical strain is reached, is found to agree with present experimental data. A rapid method of determining the sustained load strength of timber is suggested on the basis of this hypothesis. *From author's summary.*

1003. KRECH, H. Untersuchungen über den Zusammenhang zwischen Biegefestigkeit des Holzes und Biegegeschwindigkeit. **[Investigations on the relation between bending strength of wood and the rate of bending.]** *Holz Roh- u. Werkstoff* 18 (7), 1960 (233–6). 9 refs. [G.g.e.] P.R.

[Cf. *F.A.* 21 No. 4903.] Measurements of bending strength in relation to rate of bending (v) in the range $2 \times 10^{-6} < v < 5$ m./sec. showed that the increase in maximum stress was proportional to the logarithm of the appropriate bending rate. This confirms earlier work [see *F.A.* 11 No. 339]. Deflection was not independent of v, and showed a slight increase with increasing duration of load.

1004. HATAYAMA, Y. **[Mechanical properties analysis of wood by means of brittle lacquer. Compression test parallel to the grain of wood with circular hole.]** *J. Fac. Agric. Iwate Univ.* 4 (4), 1960 (380–7). 1 ref. [Jap.e.e.] O.R.E.

Using a technique previously described [see *F.A.* 16 No. 4523], the stress distribution was studied in 5 × 5 × 15 cm. samples of *Cryptomeria japonica* (with a hole of 1 cm. diam. bored through some of them) subjected to compression ||. The crack patterns are illustrated. The principal strain ran perpendicular to a crack at any point in the crack pattern. The effect of the holes on the stress distribution differed, according to whether they were left empty, or were plugged with a softwood or a hardwood.

1005. GIORDANO, G., and CURRÒ, P. **Variation of the shearing strength perpendicular to the grain of Eucalypt wood in relation to temperature (preliminary report).** [*Docum.*] *4th Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/EU*/60-13*b*, 1960. pp. 5. [E.] Limited distribution.

Samples were tested from a tree of *Eucalyptus rostrata*. Mean maximum shearing strength at 95° C. was 37% less than that at 25°.

813. Wood Chemistry

See also Nos. 1171, 1180, 1202, 1204.

1006. FREJDIN, A. S., MALINSKIJ, JU. M., and KARPOV, V. L. Dejstvie ionizirujuščej radiacii na himičeskuju ustojčivost' drevesiny. **[Effect of ionizing radiation on the chemical properties of wood.]** *Gidrol. lesohim. Prom.* 12 (4), 1959 (4–7). 10 refs. [Russ.] P.R.

The samples used were sawdust from Scots Pine sapwood irradiated and used in earlier experiments [see *F.A.* 20 No. 3696]. Increasing doses of radiation (up to 500 mega-r.e.p.) reduced the contents of lignin and cellulose, increased the solubility of wood in both hot and cold water, increased the content of carboxyl groups, reduced the pH of water extracts, and slightly reduced the quantity of resinous substances extractable with alcohol/benzene. It is concluded that radiation causes greatest damage to the carbon fraction of wood, and the possibilities of using ionizing radiation to facilitate the process of hydrolysis are pointed out.

1007. **Chemical analysis of wood.** *Technical Note, Forest Products Research Institute, Laguna, Philippines* No. 4, 1960. pp. 4 + 2 tbls. P.R.

Gives tabulated results of analysis of 29 broad-leaved and 3 coniferous species.

1008. PEARL, I. A., and BEYER, D. L. **Studies on the chemistry of Aspenwood. VI. Products of alkaline hydrolysis of various portions of the Aspen tree.** *Tappi* 43 (7), 1960 (611–3). 8 refs. P.R.

[Cf. *F.A.* 21 No. 2340.] The sapwood (s.w.), heartwood (h.w.), rootwood (r.w.), and bark of a tree of *P. tremuloides*, ground either to sawdust or to small particles, were subjected to alkaline hydrolysis at atmospheric pressure and the products were determined. The yields of known compounds were essentially the same for s.w. and h.w., except for syringaldehyde, which appeared to be concentrated in the s.w. The chief product for both s.w. and h.w. was *p*-hydroxybenzoic acid. *p*-Coumaric acid was the chief component of the bark-hydrolysate extract. The yield of ether extract from r.w. was approximately the same as that from the whole stemwood, but the combined yield of known substances was only about half that from the whole stemwood. Ferulic acid (not found in stemwood or bark) and *p*-hydroxybenzaldehyde were the chief products of alkaline hydrolysis of r.w., and *p*-hydroxy benzoic acid was only a minor component. Particle size of the wood appeared to have little effect on the yield of products of hydrolysis.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 32, 987–8, 1082, 1096, 1195.

1009. EPSTEIN, J. A., and LEWIN, M. **Studies on the nitration of *Eucalyptus rostrata*. III. Hydrolysis of nitrated wood.** *Tappi* 43 (7), 1960 (630–4). 28 refs. P.R. [Cf. *F.A.* 21 No. 986.]

1010. OKUN', M. G., *et al.* Uskorennyj metod opredelenija lignina. **[Rapid method of determining lignin content.]** *Gidrol. lesohim. Prom.* 12 (5), 1959 (10–1). 5 refs. [Russ.] P.R.

Describes a method of analysis (employing H_2SO_4) which takes only 1½ hr.

1011. FREUDENBERG, K. Entstehung des Holzes und des Lignins. **[The origin of wood and lignin.]** *Holz Roh- u. Werkstoff* 18 (8), 1960 (282–7). 1 ref. [G.e.] P.R.

A general article summarizing present knowledge on the subject.

1012. KRATZL, K. **On the biosynthesis of Gymnospermae and Angiospermae lignins.** *Tappi* 43 (7), 1960 (650–3). 22 refs. P.R.

Reviews work by the author and others, especially on lignin precursors in Spruce, Beech and Lilac.

1013. FREUDENBERG, K., and LEHMANN, B. Aldehydische Zwischenprodukte der Ligninbildung. **[Aldehyde intermediate substances in lignin formation.]** *Chem. Ber.* 93 (6), 1960 (1354–66). 20 refs. [G.g.] P.R.

Two aldehydes, those of dehydro-diconiferyl alcohol and guaiacyl-glycerine-coniferyl ether, were isolated by paper chromatography and identified, bringing to 11 the number of identified intermediate substances occurring in the enzymatic biosynthesis of lignin from coniferyl alcohol.

1014. **Lignification in model systems.** *Extr.* from *Rep. Commonw. Sci. Industr. Res. Organ. Aust. 1958/59*, 1959 (83).

Studies on the progress of natural lignification in woody plants have been extended to various model systems. The system eugenol/peroxidase/H_2O_2 has been investigated by using *Avena* coleoptile parenchyma and stems of *Eucalyptus regnans* and *Pinus radiata* as experimental material. The eugenol 'lignin' so produced is deposited between the microfibrils, thus stiffening the wall. The reaction is not influenced by the presence of some reducing substances. In woody stems, the products of the reaction in the cambial zone are different from those in partially differentiated wood. The course of lignification appears to be controlled by the reducing potential of the cells in which the reaction takes place. Eugenol destroys the osmotic properties of the cells, and so the reaction is confined to the cell-walls and does not involve participation of the cytoplasm. Further work is in progress to establish the relationship between artificial and natural lignification. [Cf. *F.A.* 21 No. 979.]

1015. BLAND, D. E. **Methanol lignin from *Eucalyptus regnans* F. Muell. and its purification by countercurrent distribution.** *Biochem. J.* 75 (1), 1960 (195–201). 25 refs. O.R.S.

1016. DESMET, J. Mise en évidence de l'hétérogénéité d'une lignine native de *Populus canescens* Sm. **[Heterogeneity of a native lignin of *P. canescens*.]** *C.R. Acad. Sci., Paris* 250 (20), 1960 (3374–6). 7 refs. [F.f.] O.R.S.

A study of 4 fractions obtained from the native lignin indicated that it is not a homogeneous substance.

1017. WHISTLER, R. L. **Methods used in the characterization and proof of structure of cell-wall polysaccharides.** *Tappi* 43 (2), 1960 (177–80). 72 refs. P.R.

A review of literature, describing the methods and their application to solve present problems concerning cell-wall polysaccharides.

1018. PROSIŃSKI, S., and BABICKI, R. O nowej metodzie oznaczania celulozy przy użyciu rozcieńczonych roztworów kwasu azotowego i wodorotlenku sodu. **[A new method of determining cellulose by using dilute solutions of HNO_3 and NaOH.]** *Sylwan* 104 (1), 1960 (95–9). 4 refs. [Pol.]

Parallel analyses were made of a number of woods, and of pulp, in order to compare results given by a new method (*a*) developed by O. N. Krasovskaja and V. M. Nikitin [*Bumažnaja Promyslennost'* 30 (1), 1955 (14–5)] with those of Kürschner and Hoffer's method (*b*). The cellulose contents determined by (*a*) were only 69–85% of those by (*b*). However, since (*a*) is quick, simple, and cheap, it may be widely applicable for comparative serial analyses.

1019. JABBAR MIAN, A., and TIMELL, T. E. **Isolation and characterization of a cellulose from the inner bark of White Birch (*Betula papyrifera*).** *Canad. J. Chem.* 38 (7), 1960 (1191–8). 44 refs. O.R.S.

A pectic acid, a 4-*o*-methylglucuronoxylan and a cellulose, and minor amounts of other polysaccharides have been isolated. The constitution and molecular properties of the cellulose, which formed 28% of the bark, were studied.

1020. ASPINALL, G. O., and NICOLSON, A. **The catalytic oxidation of European Larch ε-galactan.** *J. Chem. Soc.* June, 1960 (2503–7). 9 refs. O.R.S.

[Cf. *F.A.* 19 No. 3441.] The structural significance of the results is discussed.

1021. TYMINSKI, A., and TIMELL, T. E. **The constitution of a glucomannan from White Spruce (*Picea glauca*).** *J. Amer. Chem. Soc.* 82 (11), 1960 (2823–7). 49 refs. O.R.S.

813.2. Minor Organic Constituents. Extractives

See also Nos. 97, 980, 1101, 1121, 1198, 1204, 1210–1.

1022. DÄSSLER, H.-G. Pflanzeninhaltstoffe—Vierte Mitteilung: Untersuchung der Extraktstoffe von *Picea omorica*. **[Plant extractives—IV. Investigation of extractives from *P. omorika*.]** *Holz Roh- u. Werkstoff* 18 (5), 1960 (162–3). 7 refs. [G.g.e.] P.R.

With benzol extraction, 0·79% fatty oil was obtained (in relation to oven-dry wood). Saponification of the oil gave 26·29% solid and 72·07% liquid fatty acids. Determination of thiocyanogen values showed that the constituents of the liquid fatty acid were 38% oleic acid, 31·9% linoleic acid, and 1·22% linolenic acid. The unsaponifiable portion contained cetyl alcohol, and probably ceryl alcohol and sitosterol.

1023. MCLEAN, J., and WATTS, W. E. **Extractives from the Dipterocarpaceae.** *J. organ. Chem.* 25 (7), 1960 (1263). 8 refs. O.R.S.

Dipterocarpol was isolated from wood of *Dipterocarpus verrucosus* and *D. grandiflorus* in yields of 0·12 and 0·16% respectively.

1024. JANES, N. F., and MORGAN, J. W. W. **The occurrence of dehydrokaempferol in *Nothofagus* species.** *J. Chem. Soc.* June, 1960 (2560–5). 37 refs. O.R.S.

The absolute configuration of (+)-dihydrokaempferol, a constituent of Coigue (*Nothofagus* spp.—the sample used was probably *N. dombeyi* or *N. antarctica*) has been determined. Engelitin and isoengelitin have been isolated from Rauli (*N. procera*).

1025. SANGSTER, A. W. **Investigation of Greenheart [*Ocotea rodiaei*] alkaloids by paper electrophoresis.** *Journal of Chromatography, Amsterdam* 3 (1), 1960 (92–3). 2 refs. [E.] O.R.S.

Results of a typical electrophoretic run show a mixture of alkaloids, only partially resolved, bases II, III and IV, *d*-tubocurarine chloride and *l*-curine hydrochloride. Detailed structural investigations will be published elsewhere.

1026. HILLIS, W. E., and CARLE, A. **The formation of phenolic substances in *Eucalyptus* spp.** *Repr.* from *Biochem. J.* 74 (3), 1960 (607–15). 59 refs. (*Repr. For. Prod. Aust.* No. 419).

Describes the distribution of phenolic substances in the woody tissues and kino of *E. gigantea* and *E. sieberiana* [cf. *F.A.* 20 No. 3735]. Ellagic acid is present to a varying degree in all woody and phloem tissues of these species; the ellagitannins present include juglanin, corilagin and, in the phloem of young *E. sieberiana*, β-glucogallin. The ratio of free to combined ellagic acid is low in the sapwood (s.w.), higher in the phloem, and highest in the heartwood (h.w.), and the amount of free and combined ellagic acid is higher in the h.w. than in the s.w. Catechin is present in the bark and s.w. of both species and in the cambium of *E. sieberiana*; shikimic acid and β-glucogallin in the cambium and phloem of young *E. sieberiana*. Traces of polymerized leucodelphinidin and leucocyanidin were present in all woody tissues examined. The substances removed from the methanol extract of h.w. with light petroleum, ether and ethyl acetate do not give a red colour when heated with butanol/HCl. The kinos from these species contain polymerized leucodelphinidin and traces of leucocyanidin and ellagic acid. On acid treatment, gallic acid and further amounts of ellagic acid are liberated, and also phloroglucinol and other substances not present in the woody tissues. Present evidence indicates that kino and the phenolic constituents in woody tissues are formed *in situ* from starch, glycosides and translocated carbohydrate. *From authors' summary.*

1027. FREUDENBERG, K. Catechine und Hydroxy-flavandiole als Gerbstoffbildner. **[Catechins and hydroxy-flavandiols as tannin-forming substances.]** *Experientia, Basle* 16 (3), 1960 (101–5). 35 refs. [G.e.] O.R.S.

Discusses the synthesis and occurrence in nature of some hydroxyflavans and the processes by which they are converted to tannins. In nature, the self-condensation of polyhydroxyflavans (e.g. in wood of *Acacia catechu* or Quebracho) occurs without enzymatic action. Dehydrogenative polymerization occurs with the formation of brown or red phlobaphenes, generally insoluble.

1028. HASEGAWA, M. **On the flavonoids contained in *Prunus* woods.** *J. Jap. For. Soc.* 40 (3), 1958 (111–21). 39 refs. [E.e.jap.]

[Cf. *F.A.* 21 No. 1000.] The basic flavonoids synthesized in the *Prunus* spp. examined, viz. *P. yedoensis*, *P. jamasakura*, *P. verecunda*, *P. speciosa*, and *P. campanulata*, are naringenin, aromadendrin and their glucosides.

813.4. Chemical Effects of Heat. Chemistry of Thermal Decomposition

See Nos. 982–3.

813.5. Reaction with Metals

See No. 1029.

813.6. Effect of Chemicals on Wood. Resistance to Chemical Attack

1029. GRAY, V. R. **Timber properties and corrosion.** *Inform. Bull. Timb. Developm. Ass., Lond.* No. C/IB/4, 1959. pp. 7. 14 refs. Price 3*s.* 6*d.*

Discusses the use of timber as a material capable of resisting corrosion caused by certain external conditions and a variety of chemicals or other liquids. The accelerated corrosion of metals caused by the acetic acid formed in damp timber, and the staining of certain timbers by Fe and Cu salts, are also examined.

813.9. Wood Chemistry: Miscellaneous

See No. 276.

814. Natural Durability. Old Wood. Fossilized Wood

See also Sections 844 and 845.

1030. VIHROV, V. E. Ispol'zovanie drevesiny v drevnem Novgorode. **[The use of wood in ancient Novgorod.]** *Trud. Inst. Les.* No. 37, 1958 (266–79). 5 refs. [Russ.]

An account of the wooden tools, utensils, structures etc. excavated in Novgorod, which date from the 10th to 15th centuries, discussing species used, etc.

815. Effect of Growth Factors on Structure and Properties

See also Nos. 516, 916, 957, 966–7, 977, 998, 1008, 1148, 1153–7.

1031. KÜBLER, H. **Studies on growth stressses in trees. I. The origin [cause] of growth stresses and the stresses in transverse direction. II. Longitudinal stresses. III. Effect of heat treatment on the dimensions of green wood.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* Nos. 4542*A*, *B*, *& C*, 1959. pp. 20 + 23 + 16 + many dgms. & tbls. Many refs. Transl. by J. Hardy from *Holz Roh- u. Werkstoff* 17 (1–3), 1959 (1–9; 44–54; 77–86). [See *F.A.* 20 No. 3740; 21 No. 2368.] Limited distribution.

1032. PAUL, B. H. **Importance of the width of growth rings in lumber.** *Sth. Lumberm.* 201 (2504), 1960 (34).

In old-growth samples, the mode for 58% of 47 N. American conifer species was in the range having ⩾ 21 rings/in., and never in that having ⩽ 5 rings/in. The mode for 6 out of 10 second-growth conifers was in the range having 6–10 rings/in. A table of modal ring widths and mean basic densities for old- and second-growth trees of 10 species shows that the effect of growth rate on density varied but was generally small.

1033. HAMILTON, J. R. **Certain wood properties of southern Red Oak (*Quercus falcata* Michx.) in relation to location within the bole and to environment.** *Abstr. of thesis*, in *Dissert. Abstr.* 20 (11), 1960 (4231–2). O.R.S.

Six trees were studied in respect of the characters: (1) sp.gr., (2) ring width, (3) late wood, (4) longitudinal, (5) radial and (6) tangential shrinkage, (7) side hardness, (8) toughness, (9) fibre and (10) fibre-tracheid length, (11) early-wood vessel diameter, (12) ray width, and the % of the transverse surface in (13) ray, (14) early-wood parenchymatous, (15) late-wood parenchymatous and (16) late-wood fibrous tissue. Data were collected from each 10-year increment of two radii at 10% intervals of total tree height. A polynomial equation was computed in terms of height and age, their squares, and their cross product, for each wood property in the tree. An analysis of these regressions indicated that all properties varied both horizontally and vertically within individual trees, the degree of variation differing with the property. The patterns assumed by the properties were not constant for all trees and there was more difference between trees for some properties than others, variation between trees being least for (1), (3), (9), (16), (11) and (12). The regression equations for all trees were combined to provide an average mathematical expression for the response of the properties to height and age. More than 70% of the variation in (9), (10), and (11) was accounted for by the average regression. For (1), (2), (3), (7), (8) and (16), 50–70% of the variation was associated with the regression, whereas association was lower for the remaining properties. The original data were further analysed to develop prediction equations in terms of three easily measured properties—(1), (2) and (3)—for the others, which are more difficult to measure. Highly significant equations were developed for all properties except (13), (4), (5) and (6). The effect of environment was studied by determining (1), (2), and (3) in increment cores from trees from two geographic and climatic zones in the Piedmont Plateau, from N. and S. aspects within the zones, and from upper and lower topographic positions within the aspects; data on some stand and soil characteristics were also obtained. None of the site characteristics appeared to have any major effect on the properties.

1034. ČEVEDAEV, A. A. Lesovodstvennoe značenie vlijanija kal'cija na pročnost' drevesiny. **[The silvicultural importance of the influence of Ca on wood strength.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 34, 1958 (166–72). [Russ.]

Discusses the literature and also the results of an investigation which showed that the strength (bending, hardness, compression, etc.) of Oak wood from trees grown on soil rich in Ca was 20–34% less than that from trees on more acid sites. On such Ca-rich sites, the strength of Scots Pine wood approaches that of Oak, and it is concluded that silviculturally it would be profitable to convert these Oak forests to Pine.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

See also No. 944.

1035. REINEKE, L. H. **Feed-speed relationships for cutting tools.** *Rep. U.S. For. Prod. Lab., Madison* No. 2184, 1960. pp. 4 + 1 chart. P.R.

Presents details of the alignment chart already described elsewhere [see *F.A.* 21 No 4949].

821. Barking

See No. 1071.

822. Saws and Sawing

See also No. 1159.

1036. KNEŽEVIĆ, M. Maksimalni španung jednakih debljina dasaka pri posebno tretiranom rezu. **[Spacing of frame-saw blades for maximum lumber yield when cutting boards of equal thickness, with kerf calculated separately.]** *Šumarstvo* 12 (9/10), 1959 (443–50). 4 refs. [Serb.g.]

A further theoretical exposition of the author's theories of frame-saw blade spacing, concluding that kerf width should be calculated as part of board thickness rather than separately. [Cf. *F.A.* 17 No. 861.]

1037. Contribution à l'étude du sciage au ruban. L'influence de la lame. **[Bandsawing. The effect of the blade.]** *Cah. Centre Tech. Bois* No. 17 (2nd ed.) 1958. pp. 25. [F.] P.R. [Cf. *F.A.* 18 No. 952.]

1038. ANTOINE, R. C., *et al.* Le débit des bois à la scie à ruban. V. Étude du sciage de treize bois du Congo belge. **[Conversion by bandsaw. V. Sawing 13 species from the Belgian Congo.]** *Publ. Inst. Nat. Étude Agron. Congo Belge* (*Sér. tech.*) No. 60, 1960. pp. 188. [F.] Price *Fr.*125.

[Cf. *F.A.* 21 No. 1028.] A study was made, and is reported in detail, of the following species: *Brachystegia laurentii, Celtis mildbraedii, Copaifera mildbraedii, Drypetes gossweileri, Fillaeopsis discophora, Guibourtia arnoldiana, Holoptelea grandis, Irvingia gabonensis, Nesogordonia* sp., *Panda oleosa, Podocarpus usambarensis, Ganophyllum giganteum,* and *Scorodophloeus zenkeri.*

1039. STUPNEV, G. Voprosy programmirovanija avtomatičeskoj raskrjaževki. **[Problems in programming automatic cross-cutting.]** *Lesn. Prom.* 1960 (6), (12–4). 1 ref. [Russ.]

Discusses the problems, and, on this basis, lists the basic design principles necessary in a machine for automatic cross-cutting of tree-length logs.

1040. BAUM, V. G. Avtomatičeskij raskrjaževočnyj agregat 'Kometa'. **[The 'Kometa' automatic cross-cutting unit.]** *Lesn. Prom.* 1960 (6), (6–8). [Russ.]

Description, illustrations and specifications of this automated 11-bladed circular-saw unit for sawing pitprops.

1041. **The Sorbeau saw.** *For. Equipm. Note, FAO* No. *D*.26.60, 1960. pp. 1.

Designed as a portable unit for ripsawing planks or square timber from large logs at stump, the unit employs the principle of attaching rails on a rigid framework to the log. The saw then travels up and down on the rails, cutting simultaneously in the vertical and horizontal planes.

1042. JAKUNIN, N. K. Režimy prodol'nogo pilenija kruglymi pilami drevesiny tverdyh listvennyh porod. **[Schedules for rip-sawing hardwoods with circular saws.]** *Derev. Prom.* 9 (3; 4), 1960 (9–11; 8–10). [Russ.] P.R.

Presents the results of a study made in 1954–55 to determine the values of the specific work in cutting when rip-sawing hardwoods (Oak, Beech, Birch, Hornbeam and Aspen) with swage- and spring-set circular saws, and to work out schedules for the various saw units tested. Comparison of the data obtained on optimum feed-rates, and clearance, sharpness and hook angles etc. [tabulated for each species] with the corresponding values for softwoods, indicated that, for practical purposes, the power-requirement for sawing the hardwoods may be taken as 1·5 times the values for the specific work in cutting softwoods.

823. Planing. Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

See also No. 1159.

1043. WALKER, K. J. S., and GOODCHILD, R. **Theory of cutting. Part 1. Experiments in rectilinear cutting.** *Spec. Rep. For. Prod. Res., Lond.* No. 14, 1960. pp. 25. 6 refs.

[Cf. *F.A.* 19 No. 997.] As a first step towards the development of a theory of cutting, straight-line cutting was investigated. Cutting forces were measured, when cutting ||, for various chip thicknesses and cutting angles, and at speeds from 10 to 9000 ft./min. The effect of changes in speed was found to be slight at > 1000 ft./min., but below this speed the forces increased. The formation of two distinct types of chip was confirmed. *From authors' summary.*

824. Forms of Joint. Jointing and Assembly

824.8. Glues and Gluing

1044. **Proceedings of the symposium on adhesives for the wood industry, held at U.S. Forest Products Laboratory, Madison, Wisconsin, January 13–15, 1960.** *Rep. U.S. For. Prod. Lab., Madison* No. 2183, 1960. pp. 83 + 5 photos. P.R.

Summarizes the programme, which included film shows, discussions, and papers, abstracts being given of the latter on such subjects as the nature of wood and adhesive bonds (*A. A. Marra*), wood/moisture relations as applied to glued-wood products (*A. J. Stamm*), and a review of present types of woodworking glues (*D. Brouse*).

1045. CHUGG, W. A., and GRAY, V. R. **The durability of acid-setting phenolic resin adhesives.** *Inform. Bull. Timb. Developm. Ass., Lond.* No. *C/IB*/5, 1960. pp. 5. 14 refs. Limited distribution.

A brief survey of published information on the durability of cold-setting phenolic adhesives for timber. Suggestions are made on the problems caused by the acid hardeners used with these glues.

1046. HERRICK, F. W., and CONCA, R. J. **The use of bark extracts in cold-setting waterproof adhesives.** *For. Prod. J.* 10 (7), 1960 (361–8).

Adhesives composed of HT-120, a spray-dried Na salt of an ammonia extract of Western Hemlock bark (30 to 60%) plus a resorcinol-formaldehyde

resin with additional formaldehyde, produced strong bonds in laminates, chiefly of Douglas Fir. Formulations having acceptable pot life, etc. were developed.

1047. HILLIS, W. E., and URBACH, G. **Reaction of polyphenol with formaldehyde.** *J. appl. Chem.* 9 (12), 1959 (665–73). 30 refs. O.R.S.

Among polyphenols studied were extracts from Wattle (*Acacia mollissima*), Mangrove (*Rhizophora mucronata, R. apiculata, Bruguiera gymnorrhiza*), *Eucalyptus wandoo* and *E. calophylla*, and *Pinus radiata*.

1048. SLOOTEN, H. J. VAN DER. Resina de fenol-formaldehido para contrachapeado obtenida del tanino de *Rhizophora mangle*. [**A phenol-formaldehyde resin glue for plywood and laminated wood, obtained from tannin of *R. mangle*.**] *Bol. Inst. For. Latino Amer., Mérida* No. 6, 1960 (34–9). 5 refs. [Span.]

Aqueous extracts of bark of *R. mangle*, with an alkali to act as catalyst, plus wood flour and a small quantity of paraformaldehyde, made a good glue for ply- and laminated wood. With a pH of 5·1, it had a pot life of 4 hours and, when applied under pressure for 10 min. at 140° C., it gave satisfactory strength values, even under humid conditions.

1049. FREEMAN, H. G., and WANGAARD, F. F. **Effect of wettability of wood on glue-line behaviour of two urea resins.** *For. Prod. J.* 10 (6), 1960 (311–5). 1 ref.

[Cf. *F.A.* 21 No. 3744.] Supplementary tests on six tropical species of similar pH and, except Teak, high sp.gr., to determine the effect of wettability on shear strength and optimum assembly time. Neither maximum shear strength nor length of optimum assembly time showed a clear correlation, but tolerance to prolongation beyond the optimum was greatest in woods with low wettability.

1050. CURRIER, R. A. **Finger jointing at high moisture content.** *For. Prod. J.* 10 (6), 1960 (287–93). 17 refs.

Douglas Fir 2 × 4-in. scantlings, finger-jointed at ca. 20% m.c. or at different m.c.'s for the two pieces to be joined (one at 20%, the other at 14 or 8% m.c.) had, if tested at 8–10% m.c., modulus-of-rupture values ca. 19–28% below those obtained if tested at 20%, and also slightly lower elasticity, but they compared well in strength with solid construction or standard-grade 2 × 4-in. lumber. Scarfed joints having a slope of 1 : 6 glued at combinations of 20 and 14% m.c. appeared to suffer no loss in breaking strength.

825. Cleaving. Adzing. Mechanical Comminution

1051. RUŠNOV, N. P. Analiz sposobov ustanovki režuščih nožej v barabannyh drobilkah. [**Analysis of methods of installing the cutting blades in drum-type hogs.**] *Gidrol. lesohim. Prom.* 12 (4), 1959 (11–2). [Russ.] P.R.

After analysing the two alternative ways of fitting the blades, viz. (*a*) inside the drum, or (*b*) on the drum's surface, concludes that (*a*) is the better arrangement for hogs used in the wood-hydrolysis industry.

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

See also No. 1062.

1052. LUTZ, J. F. **Heating veneer bolts to improve quality of Douglas-Fir plywood.** *Rep. U.S. For. Prod. Lab., Madison* No. 2182, 1960. pp. 14 + 8 photos, 2 drawings, 2 tbls. 16 refs. P.R.

Describes three methods [see *F.A.* 21 No. 3746; 15 Nos. 2918–9], and discusses the advantages and limitations of each.

829.1. Finishing

See Nos. 944, 1116.

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

See also Nos. 941–2, 944–5.

1053. **Some features of the development in the Finnish forest industry during 1959.** *Finn. Pap. Timb.* 10 (4–6), 1960 (41–9; 54–64, 72; 75–81). [E.]

An illustrated survey of modernization and expansion in the sawmill, plywood, particle-board, pulp, paper, board and fibreboard industries, power and steam plants, etc.

1054. [**Woodworking in Japan.**] *Wood Ind., Tokyo* 15 (8), 1960. pp. 49. Many refs. [Jap.] P.R.

Contains mainly reviews on technical and administrative problems of the industry, but includes [with English summary] one original research paper by *Y. Kanehira* and *T. Taniguchi* on the preservative treatment of *Pasania sieboldii*.

831. Fuelwood and Various Types of Rough Timber

See also Nos. 1040, 1077, 1084, 1087–90.

1055. VERTEL′, É. I. Voprosy lesosnabženija šaht Pečorskogo ugol′nogo bassejna. [**Problems of timber supply for the coal mines of the Pechora basin.**] *Lesn. Prom.* 1960 (8), (30–1). [Russ.russ.]

Analyses the position for the period of the current Seven Year Plan (to 1965), pointing out the need for radical improvement in both quantity and quality of the timber supplied by the surrounding forest areas.

1056. LEBACQ, L., VANDENBOSCH, P., and SMETS, W. Supports d'alignement en bois pour lignes aériennes de haute tension au Congo belge et au Ruanda-Urundi. [**Wooden supports for high-tension transmission lines in the Belgian Congo and Ruanda-Urundi.**] *Bull. agric. Congo belge* 51 (2), 1960 (367–91). [F.du.]

Describes the felling, conversion, and preservative treatment of Eucalypts in pole plantations, and the design and erection of the supports.

1057. FRANČIŠKOVIĆ, S., and GAJIĆ, M. Razvoj i uloga željezničkog praga. [**The development and role of the railway sleeper.**] *Šum. List* 83 (8/9), 1959 (313–25). 6 refs. [Croat.e.]

Traces the history of wooden sleepers and sleepers

made from competing materials (metal, concrete). As Beech, the most durable European species after treatment, is common in Jugoslavia, suitable wood is readily available, though oil preservatives must be imported. Sleepers in Jugoslavia last 14–17 years, and 1,300,000 must be replaced annually. The reasons for this relatively low durability are inadequate handling before preservation and use of wrongly prepared preservatives.

1058. CALDERON, E. F. Los durmientes labrados de pino constituyen cortas de emergencia. **[Pine sleepers are emergency fellings.]** *Mensajero for., Durango* 18 (188), 1960 (11 . . . 21). [Span.]

Discusses the use of Pine timber for sleepers in Mexico (over ¾ of the sleepers produced in 1956 were of *Pinus* species), and the waste involved, both by axe-shaping and by sawing. The numbers of young Pines felled annually, the area affected, forest devaluation, deforestation, and the social and economic consequences are discussed, and recommendations are made which would ensure the use of more of the tropical hardwoods in place of Pine.

832. Mills, Their Functions and Products

1059. Verhütung von Explosionen und Bränden durch Holzstaub. **[Preventing explosions and fires caused by wood dust.]** *Merkheft, Deutsche Gesellschaft für Holzforschung, Stuttgart* No. 9 (2nd ed.) 1960. [G.] Price *DM*.2·50. From review in *Holz-Zbl.* 86 (83), 1960 (1180). [G.]

Contains many practical examples.

832.1. Sawmills and Planing Mills

See also Nos. 1035–43, 1053, 1071, 1163, 1255.

1060. BREŽNJAK, M. Pilane potočare u Gorskom Kotaru. **[Water-driven sawmills in Gorski Kotar.]** *Šum. List* 84 (5/6), 1960 (156–65). 4 refs. [Croat.e.]

Gives data on existing water-driven sawmills, discusses their development, present state, and prospects, and analyses the technological methods used and the quality of the material produced.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 974, 1044 *et seq.*, 1052–3, 1158, 1162–3.

1061. **Trials of timbers for decorative veneering. Progress report fifty-six [trials of timbers series], May 1960. Turkey Oak—*Quercus cerris*—home-grown.** Forest Products Research Laboratory, Princes Risborough. 1960. pp. 6. P.R.

Turkey Oak, although unsuitable for plywood manufacture, can apparently, if sufficiently large trees are available, be sliced into veneer which (though not of the quality of English or European Oak) could be used as decorative veneer. The material examined was small and further trials are desirable.

1062. POUZEAU, M., and PRADAL, H. Le placage dédoublé dit 'écailleux' dans l'okoumé déroulé. **[The so-called 'splintery' delamination of plywood made from Okoumé veneer.]** *Bois For. Trop.* No. 72, 1960 (51–8). [F.e.span.]

The main cause of this defect is faulty adjustment of the pressure bar (too high or with excessive pressure) in the veneer-peeling machine.

1063. SAWADA, M., KONDO, K., and HATA, K. **[Studies on the elasticity of plywood. II. The effect of grain direction on the elastic constants of multilayer plywood in tension or bending.]** *J. Jap. Wood Res. Soc.* 5 (4), 1959 (131–8). 4 refs. [Jap.e.*e.*] P.R.

Presents a method for determining the modulus of elasticity of 3-, 5- and 7-ply samples of Lauan plywood. The basic constants of all the veneers used were derived from equations for tension and bending strength (structural data tabulated in English), and the calculated values for both tension and bending tests agreed well with observed results.

1064. BAUR, E. Bemerkungen über Zug-Scherprüfungen an dreifach verleimten Sperrholzplatten nach DIN 53255. **[Remarks on tensile-shear tests on three-ply sheets according to [German standard] DIN 53255.]** *Holz Roh- u. Werkstoff* 18 (6), 1960 (219–22). 4 refs. [G.g.e.] P.R.

Theoretical and practical investigations show that the single tensile-shear test (DIN 53255) is incorrectly classed as shear test, and should be removed from this category, as in the test only pure splitting occurs. A possible improvement in the double tensile-shear test is also pointed out.

1065. KONTEK, W., and NOWAK, K. Z badań nad własnościami grubowarstwowej sklejki bukowej. **[Some properties of thick-ply Beech plywood.]** *Prace Inst. Tech. Drewna* 5 (1), 1958 (3–17). 8 refs. [Pol.pol.russ.e.] P.R.

Presents tabulated results of investigations into various mechanical and physical properties of thick-ply Beech plywood and compares them with those of solid Beech and Pine. The advantages of the plywood, e.g. good glue-line resistance, excellent bending and compression strengths, are particularly stressed.

1066. KENNEDY, D. E. **The use of Eastern Canadian woods in glued laminated construction.** *Timber of Canada* 21 (8), 1960 (35–43). 3 refs.

Experiments since 1944 at the Forest Products Laboratory, Ottawa, have shown that the manufacture of Spruce glulam stock is technically feasible. The size of Eastern Spruce [unspecified] columns and beams equal in strength to standard Douglas Fir glulam columns and beams is determined. It is concluded that, in general, the Eastern Spruce glulam is likely to be slightly more expensive, but that in certain cases it might be cheaper.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

See also No. 324.

1067. MASANI, N. J., and BAJAJ, A. N. **Wind pressure on buildings (rationalised) (from foreign experimental approach).** *Indian For. Rec.* (*Timber Engineering*) 1 (1), 1958 (1959). pp. 33. 2 refs.

The object of the paper is to show in line-diagrams

and tables some of the stock designs of timber building met with in practice, so as to determine the wind pressures for a particular building without undue caution against wind loads. *From authors' summary.*

833.1. Building Components and Fittings: General

See Nos. 1085, 1091, 1155.

833.2. Special Uses in Residential, Commercial and Public Buildings

1068. Holz — Heim — Hygiene. **[Wood—homes—health.]** *Mitt. Dtsch. Ges. Holzforsch.* No. 43, 1958. pp. 126. [G.] P.R.

Includes articles on: Wood and wood-based materials for sound insulation in buildings (*J. Wiedefeld*); Wood in dwellings (*H. Reiter*) [tests on heat and moisture conditions in 5 experimental houses of light construction at Holzkirchen, made chiefly of wood, fibreboard, or other wood-based boards or panels]; and The electro-biological advantages of wooden houses (*H. H. Kritzinger*).

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use.)

1069. KOLLMANN, F., TEICHGRÄBER, R., and KOLLMANN, F. G. Beiträge zur Entwicklung eines Fasses mit erhöhter Festigkeit. **[The development of a stronger barrel.]** *Holz Roh- u. Werkstoff* 18 (7), 1960 (236–42). 7 refs. [G.g.e.]

Examines the different types of failure with end ruptures in staves, and concludes that ca. ¼ are caused by notch stresses in the chimes and ¾ by the shape and fixing of the hoops. Improved types of chime were developed, and it was found that corrugated hoops were better than flat ones. The improved chime shape and corrugated hoops are expected to increase barrel impact strength by 130–140%.

1070. KURTENACKER, R. S. **Wood's future in the packaging industry.** *For. Prod. J.* 10 (7), 1960 (333–5).

A summary of research completed or in progress on standardization of quality of wood members for containers and pallets, on design and construction of wood pallets, including bin pallets, boxes and crates, re-usable containers, combined materials such as paper-overlaid veneer, etc.

838. Vehicles (including Ships, Boats, Aircraft)

See No. 1111.

839.8. Industrial Waste Wood, its Processing and Uses

See also No. 1164.

1071. APPLEFIELD, M. **The production and marketing of Pine wood residues by small sawmills.** *Bull. Tex. For. Serv.* No. 50, 1960. pp. 14.

Analysis of data from sawmills in East Texas showed that the use of slabs, edgings and ends as raw material for pulp chips can increase profits by as much as $35.00 a day in a mill with average production of 10,000 bd. ft./day. The use of a log barker to remove bark before conversion is more economic than use of a slab-barker to bark slabs, edgings and trims after conversion.

1072. BAUSCH, H., and HARTLER, N. **Determination of chip dimensions.** *Svensk PappTidn.* 63 (10), 1960 (319–26). 4 refs. [E.e.sw.g.] P.R.

A comparison of data on the distribution of chips by length and thickness, obtained by (*a*) hand sorting (measuring length with a rule and thickness in notches in a thin plate) and (*b*) conventional screening, showed that (*b*) gives no effective sorting by length and only limited sorting by thickness; thus (*a*) must be used when separate information on these dimensions is needed.

1073. **Outside storage of Pine pulpwood chips.** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1959*, 1960 (54–6).

In a 5-month study of freshly cut chips of 91–116% moisture content, piled 70 × 40 × 8 ft. at Fargo, Ga., m.c. increased, first on the surface through rain, and later in the whole pile, to a fairly uniform 130%. Temperatures 2 ft. below surface reached 131° F., and did not fall below 90° for the test period in most of the chips. Where they did so (at sides, top and bottom) blue-stain developed. Appraisal of decay was complicated by the prevalence of dark stain. Losses in sp.gr. were 7% after 21 weeks.

1074. LOVEJOY, H. E. **Transporting wood chips by truck.** *For. Prod. J.* 10 (6), 1960 (282–6).

Discusses types of hauling, loading and unloading equipment, and analyses costs.

1075. ALLISON, F. E., and COVER, R. G. **Rates of decomposition of Shortleaf Pine sawdust in soil at various levels of nitrogen and lime.** *Soil Sci.* 89 (4), 1960 (194–201). 6 refs. O.R.E.

Laboratory experiments with a sandy loam low in N showed that, with moisture-saturated air, wood particles that barely passed a 6-mesh sieve decomposed about as rapidly as did smaller ones. Particles left on the soil surface decomposed about as rapidly as when mixed with the soil. During an incubation period of 72 days at 30° C., the release of CO_2 from unlimed sawdust without added N was 68% of that with adequate N; in the presence of 0·4% $CaCO_3$ the corresponding value was 79%. Additions of N sufficient to bring the N content of the wood to 0·75–1·0%, were adequate for a maximum rate of decomposition. Sawdust decomposition was favoured more by addition of NO_3-N than by NH_4 salts, where the development of acidity was not controlled. Where neutrality was maintained by additions of lime, the two N sources were equally satisfactory. In 160 days, with adequate N supplied, 58% of the wood carbon was released as CO_2; the corresponding value for wheat straw was 64%. *From authors' summary.*

1076. JACQUIN, F., and MANGENOT, F. Populations microbiennes des bois. IV. Humification de copeaux dans la nature. **[Fungus populations in wood. IV. Humification of wood chips in the field.]** *Plant & Soil* 12 (3), 1960 (276–84). 7 refs. [F.f.]

[Cf. *F.A.* 21 No. 2466.] A study was made of the

composition (N, humic substances, lignin) and the fungus populations in hardwood chips exposed in heaps in the open for periods varying from 2 to 10 years. When lignin-destroying fungi are absent, the pH and the contents of lignin and N increase, and moderate quantities of humus are formed with a high exchange capacity. When such fungi are present, an abundance of humic substances is formed and the changes in the organic matter resemble those in the formation of mor.

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

841. Wood Preservation

See also Nos. 945, 1054, 1056–7, 1103, 1123–5, 1129–31, 1133–4, 1138–9, 1142.

1077. Vorträge der 6.'' Holschutz-Tagung der Deutschen Gesellschaft für Holzforschung in Hamburg am 9. and 10. Juli 1959. **[Lectures at the 6th Wood Preservation Conference of the German Society for Wood Research, Hamburg 9–10 July, 1959.]** *Mitt. Dtsch. Ges. Holzforsch.* No. 46, 1959. pp. 86. Many refs. [G.] P.R.

Comprises: The problem of protecting green timber in the tropics (*M. Fougerousse*); Investigations on the limits of activity of plant and animal pests of imported wood (*I. Schneider*) [cf. *F.A.* 22 No. 1135]; The natural durability of tropical woods (*W. Bavendamm*); Results of an outdoor experiment with wood preservatives compared with laboratory assessments of effectiveness (*T. Hof*); A method of testing preservatives against salt-water pests (*R. H. Colley*); The problem of short-fibred breaks in poles: effect of oscillating stress on the static strength properties of poles with and without preservative treatment (*W. Gillwald* and *K. Richter*); The resistance of fibre and particle boards to wood-destroying fungi and to fire (*E. Künzelmann*); Effect of wood preservative treatment on seed stored [in wooden containers] (*A. Körting*); Practical intensification of wood preservation, so achieving the longest possible duration of protection (*E. Gieseking*); Boron compounds for protecting wood against fungi and insects (*W. P. K. Findlay*); The mechanism of fluoride penetration of Scots Pine (*B. Schulze*); Distribution of the fluorine of preservative salts in softwood after brush application, spraying and dipping (*G. Becker*); Recent data on storing and hot-and-cold methods and their mathematical treatment (*G. Langendorf*); Impregnating Scandinavian Pine poles with creosote (*W. Demann*); A modified Rüping method for impregnating wood of any moisture content (*H. J. Frh. von Kruedener*); Position and prospects of wood preservation in the Polish coal-mining industry (*B. Zyska*); New information on wood preservation in mining (*G. Krug*); Wood and wood preservation in making large underground chambers in the Ewald pit (*J. Koch*); Studies on differences in the durability of treated and untreated mining timber in a pit climate favouring rot (*K. Grumbrecht*).

1078. **Final report, *ad hoc* group of experts on wood preservation (Rome 1–4 December 1959).** FAO, Rome. No. *FAO/WT/59/P-16*, [1960]. pp. 15. Limited distribution.

Recommends that a permanent Working Party on Wood Preservation should be established, to co-ordinate and stimulate wood preservation on a world basis.

1079. **Classification of wood preservatives and their methods of application.** *Brit. Stand.* No. 1282, 1959. pp. 21. Price 6*s*. P.R.

1080. TAMBLYN, N. **The importance of preservative treatments in hardwood utilization.** *Aust. Timb. J.* 26 (5), 1960 (27. . . 48). 19 refs.

A general review and discussion of some of the preservation problems arising in the utilization of hardwoods in Australia, indicating, where possible, the best current solutions or suggesting possible lines of action.

1081. MCQUIRE, A. J. **Limitations imposed by some waterborne preservatives on the soil block test method.** *N.Z. J. Sci.* 3 (2), 1960 (298–305). 6 refs. P.R.

[Cf. *F.A.* 21 No. 2453.] Tests have shown that the presence of soluble salts in the treated blocks, resulting from incomplete fixation of the preservative ingredients, or representing by-products of the fixation reactions, affects the wood-moisture relations of the blocks. The consequences are: (1) Each block creates its own micro-environment with relation to moisture; hence blocks treated with different preservatives or with different retentions of the same preservative are not strictly comparable. (2) Weight losses of blocks showing no sign of attack can result from leaching during the decay test; these may obscure the threshold value. *From author's summary.*

1082. BELFORD, D. S., and COOK, C. D. **Research on a water-borne preservative. An investigation into the distribution of salts in pressure-treated timber using an electron microscope.** *Wood* 25 (8), 1960 (330–2). 4 refs.

Complements earlier work [see *F.A.* 21 No. 2441]. Findings confirm that the preservative used in this investigation (Tanalith C) is situated largely within the cell wall, rather than merely forming a deposit in the cell lumen.

1083. SHIBAMOTO, T., and INOU(Y)E, Y. **[Studies on water-borne wood preservatives. XV. Phenyl mercury fixtan. (1) and (2).]** *J. Jap. Wood Res. Soc.* 6 (2), 1960 (49–58). 17 refs. [Jap.e.*e.*] P.R.

[Cf. *F.A.* 20 No. 5238.] Presents tabulated and graphical data showing the penetration of the preservative on filter paper, its leachability from wood [unspecified], and its absorption by cellulose; and discusses, with graphs and tables, its fungicidal effect on *Poria vaporaria* attacking Bamboo culms.

1084. Grundlegende Untersuchungen über den Nachschutz von Holzmasten mit Salzen. **[Basic investigations on the after-treatment of poles with salts.]** *Mitt. Dtsch. Ges. Holzforsch.* No. 42, 1958. pp. 75. Many refs. [G.] P.R.

Ten papers on a programme of joint research by

three institutes on behalf of the Vereinigung Deutscher Elektrizitätswerke: Planning and execution of basic investigations on the after-treatment of poles (*G. Becker* and *H. Zycha*); Investigations on the influence of timber species, main impregnation treatment and after-treatment materials on the penetration speed of after-treatment salts into the pole (trials in the open at Berlin-Dahlem) (*M. Gersonde*); Investigations on the influence of various factors on salt penetration in the after-treatment of telegraph poles (trials in the open at Reinbek) (*W. Bavendamm* and *H. Anczykowski*); Quantitative investigations on the penetration of fluoride into the pole from model bandages (trials in the open at Hann. Münden) (*H. Zycha*); Quantitative investigations on the penetration of fluoride into the pole from model bandages (trials in the open at Berlin-Dahlem) (*G. Becker* and *M. Gersonde*); Investigations on the penetration of fluoride into poles from bandages of commercial manufacture (trials in the open at Berlin-Dahlem) (*M. Gersonde* and *G. Becker*); Model laboratory experiments on the penetration of fluoride from after-treatment materials into poles of various kinds (*G. Becker* and *K. Starfinger*); Investigations on the moisture distribution at the base of poles (*W. Bavendamm* and *G. Hahne*); Rain run-off from standing poles (*H. Zycha*); Summary evaluation of the results of investigations on the after-treatment of poles with salts (*G. Becker* and *H. Zycha*).

1085. **New preservative for dip-diffusion treatment of green building timber.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 264, 1960 (3).

The new preservative, a B-F-Cr-As complex which fully retains the toxic properties of the original formulation [cf. *F.A.* 18 No. 2208] does not become highly fixed in the wood and is therefore subject to leaching. Its specific use is for indoor building timbers and it should not be used for wood in contact with the ground.

1086. GENT, P. K. VAN. **Treatment of timber with pentachlorophenol and zinc naphthenate. The relation of cost to retention and penetration.** *South African Industrial Chemist, Johannesburg* 1959 (12), (250–3). 3 refs. O.R.S.

Mixed lots of wood, each containing blocks of Red Meranti, Oregon, Philippine Mahogany, Hemlock, deal and South African Pine were treated at room temperature with (*a*) PCP and (*b*) Zn naphthenate in paraffin, using: (1) 4% (*a*) + 6% (*b*) at atmospheric pressure for 10 min.; (2) the same solution at 28 lb./sq. in. for 7½ min.; (3) 2% (*a*) + 3% (*b*) at 28 lb./sq. in. for 15 min. Treatment (2) was uneconomical; (3) was better than (1), giving approximately twice the penetration of most woods at moderately increased cost. It was concluded that correct preservative treatment of even the softest timber in these lots (South African Pine) by treatment (3) would be economic at a cost of 24*d.*/cu. ft.

1087. BORUP, L., and RENNERFELT, E. Undersökningar över möjligheten att impregnera björkvirke. **[Studies on pressure treatment of Birch.]** *Norrlands SkogsvFörb. Tidskr.* 1960 (2), (97–120). 6 refs. [Sw.sw.e.]

In laboratory-scale tests, Birch blocks were satisfactorily pressure-treated with Boliden salt, KP salt (0·3% Cu and 0·15% PCP), and creosote; the weight loss resulting from exposure to attack by different test fungi, and the minimum retentions required to prevent their growth on leached and unleached blocks, are shown in tables and graphs. Pressure treatment of Birch sleepers with Boliden salt K33 gave generally satisfactory penetration and retention. Chemical analysis showed that contents of As_2O_5 in the outer, middle and inner parts of the sleepers were of the same order as those in treated Pine. The possibility of using treated Birch in outdoor structures is discussed.

1088. MURPHEY, W. K. **Durability of three species of wood after treatment.** *Res. Circ. Ohio Agric. Exp. Sta.* No. 86, 1960. pp. 11. 1 ref.

Creosote, Cu naphthenate, and Cu tallate preservatives were applied by (*a*) pressure treatment, (*b*) hot-and-old butt treatment and (*c*) 15-second dip treatment, to American Elm, Sugar Maple and Southern Yellow Pine fence posts after 6 months' seasoning. The posts were placed in the ground and and examined regularly for 15 years. Creosote and Cu naphthenate were found to give best protection. Results with Cu tallate (a metallic soap) were variable, but in some cases good. Sugar Maple lasted less well than Elm and Pine. The higher initial expense of (*a*) was justified by the longer life of posts so treated. With (*b*), posts became unserviceable in < 7 years through decay of the upper part, costing more per post p.a. than untreated controls; and (*c*) gave inadequate penetration, so that the post centres rotted.

1089. BLEW, J. O., JR. **Comparison of wood preservatives in stake tests (1960 Progress Report).** *Rep. U.S. For. Prod. Lab., Madison* No. 1761, 1960. pp. 8 + 1 photo., 35 tbls. P.R.

[Cf. *F.A.* 16 No. 4681.] Ten 2 × 4 × 18-in. stakes of Southern Yellow Pine sapwood were treated by pressure and non-pressure processes and submitted to decay and termite exposure tests at various times since 1938 on sites in (*a*) Mississippi, (*b*) Wisconsin, (*c*) Louisiana, (*d*) Florida, and (*e*) Panama. Smaller Pine stakes, and others of treated and untreated plywood, of modified woods, laminated paper plastic, and of *Trichoderma*-infected Pine, were included in the tests at (*a*). The average life of untreated controls was ca. 1 year at (*e*), 2–3 years at (*a*), (*c*), (*d*), and ca. 6 years at (*b*). Superficial treatments by dipping and brushing with preservatives such as coal-tar creosote, and petroleum oils containing Cu or Zn naphthenates, phenyl Hg-oleate, and PCP, added from a few months to 4 years to the life of untreated stakes. Some waterborne preservatives protected the stakes less than the standard preservative oils, such as creosote and PCP solutions, when preservative retentions corresponded to those in commercial use. Other waterborne preservatives, during their testing period, showed results that compare favourably with those

obtained from standard preservative oils. *From author's summary.*

1090. TINTO, J. C. Impregnación de postes para uso rural. Experiencias realizadas en la Argentina con maderas de especies forestales cultivadas. **[Preservation of posts for rural purposes. Tests carried out in Argentina with woods of introduced forest species.]** *Foll. téc. for. Adm. Nac. Bosques, B. Aires* No. 5, 1960. pp. 13 + 24 tbls. [Span.span.]

Gives preliminary results of tests with 3 Eucalypt species, *Populus* × '*canadensis*', *Salix alba* var. *caerulea*, and *Casuarina cunninghamiana*, using a number of different treatments. Data on the methods are presented. Plots have been established for durability tests.

1091. HARROW, K. M. **Durability of treated Radiata confirmed: a field test of preservatives in building construction.** *N.Z. Timb. J.* 6 (10), 1960 (42–4). 4 refs.

A test building erected in 1948 near Auckland was constructed entirely of Radiata Pine untreated or pressure-treated at two retentions with water-soluble preservatives (H_3BO_3, NaF, Tanalith U, or $ZnCl_2$), against *Anobium punctatum*, several thousand of which were liberated in the building. Eleven years later a light to moderate infestation was found in the untreated studs, flooring, and weatherboarding, but none in any of the treated members. Analysis of exposed butt ends of the H_3BO_3-treated weatherboards showed that no appreciable quantities of preservatives had been leached out. It is concluded that water-soluble preservatives at retentions based on laboratory toxicity tests should give satisfactory protection against borers in weatherboarding so long as a good paint film is maintained.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies.

1092. WEAVER, J. W., NIELSON, J. F., and GOLDSTEIN, I. S. **Dimensional stabilization of wood with aldehydes and related compounds.** *For. Prod. J.* 10 (6), 1960 (306–10). 22 refs.

Sixteen substances, many of which had been successfully used to treat textile fibres, were tried as possible cross-linking reagents, on Ponderosa Pine. Under the experimental conditions, none formed stable cross-links. Some dialdehydes reacted easily but did not sufficiently reduce swelling. Chloral hydrate imparted good stability but was rapidly leached by liquid water, and slowly by a moist atmosphere [cf. *F.A.* 20 No. 3841]. *Frum authors' summary.*

1093. GOLDSTEIN, I. S., and DREHER, W. A. **Stable furfuryl alcohol impregnating solutions.** *Industr. Engng. Chem.* 52 (1), 1960 (57–8). 14 refs. O.R.S.

The physical properties and chemical resistance of Southern Yellow Pine were greatly improved by impregnation with such solutions, which give a high yield of furfuryl alcohol resin when heated.

843. Fireproofing and Fire Resistance

1094. GRAY, V. R. **Fire retardant treatments for timber.** *Inform. Bull. Timb. Developm. Ass., Lond.* No. *C/IB*/1, 1959. pp. 25. 58 refs. Limited distribution.

Summarizes information about existing proprietary fire retardants, mentioning the most important problems for further research, viz. water and weather resistance.

844. Attack by Plant Organisms

844.1. Sap-staining and Mould Fungi

See Nos. 81, 174–5, 1073, 1077, 1131, 1135, 1150, 1175.

844.2. Wood-destroying Fungi

See also Nos. 170–1, 1073, 1076–7, 1083, 1150.

1095. SARKAR, A. **Studies in wood-inhabiting Hymenomycetes. IV. The genus *Coriolellus* Murr.** *Repr.* from *Canad. J. Bot.* 37, 1959 (1251–70). 31 refs.

Presents a revised decription of the genus and its cultural characters. Detailed morphological and cultural descriptions of each species, diagnostic keys, and the results of infertility tests are given.

1096. HARAGUCHI, T., and YAMAGUCHI, H. **[The classification of wood-destroying fungi by the index number of wood decomposing type.]** *J. Jap. For. Soc.* 40 (12), 1958 (512–4). 5 refs. [Jap.jap.e.*e.*]

Samples of *Fagus crenata*, *Fraxinus commemoralis*, *Cryptomeria japonica* and *Cyclobalanopsis myrsinaefolia*, each of ca. 10 g. wt., were subjected to decomposition by various brown- or white-rot fungi (listed) for 3 or 6 months. The fungi were then classified according to an index number of decay (I.D.), with values ranging from 0–10 according to the formula I.D. = (lignin decomposed/cellulose decomposed + lignin decomposed) × 10. From the tabulated weighing results given, the I.D. values are seen to vary according to the wood-meal culture medium used and the period of decay [cf. *F.A.* 15 No. 841] from 0·35 with *Fomitopsis pinicola* on *C. japonica* for 6 months, to 8–10 with *Stereum frustulosum* on *F. commemoralis* for 3 months.

1097. DUNCAN, C. G. **Wood-attacking capacities and physiology of soft-rot fungi.** *Rep. U.S. For. Prod. Lab., Madison* No. 2173, 1960. pp. 28 + 15 photos, 4 gphs., 16 tbls. 32 refs. P.R.

Soft rot (s.r.) may be caused by wood-inhabiting ascomycetes and *Fungi Imperfecti* whose attack on wood is usually slower than that of basidiomycetes. Extensive tabulated data are presented on s.r. variation in hardwoods and softwoods, on temperature and growth optima, and on fungicide tolerances. Some physiological characteristics of the s.r. and wood-attacking basidiomycete fungi are compared and tentative identifications for some of the s.r. fungi, together with isolation data for > 100 organisms, are summarized.

1098. LIESE, W., and PECHMANN, H. VON. **Experiments on the effect of soft rot fungi on wood strength.** Forest Products Research Laboratory, Princes Risborough. 1960. pp. 11 + 3 gphs., 6 photos. 12 refs. Transl. from *Forstwiss. Cbl.* 78 (9/10), 1959 (271–9). [See *F.A.* 21 No. 2473.] P.R.

1099. OLIVER, A. C. **Deterioration of timber caused by soft rot fungi in the sea and in fresh water.** *Res. Rep. Timb. Developm. Ass., Lond.* No. *B/RR*/1, 1959. pp. 14. 7 refs. Limited distribution.

The depth of surface softening caused by soft-rot fungi on 8 species of timber exposed in salt water, fresh water and alternating conditions, was determined. The amount of soft-rot deterioration as determined by surface softening increased with the period of immersion, and samples in alternating conditions, but initially in salt water, seemed to show slightly greater deterioration than the other exposures. The maximum depth was never > 4 mm., even on the species showing greatest susceptibility. Iroko, Parana Pine and Baltic Redwood showed a greater, and Elm a lower, resistance than the other species examined. Microscopic examination of the deterioration is described and the presence of fruiting bodies of fungi and the extent of *Limnoria quadripunctata* attack on samples in salt water is recorded. *From author's summary.*

1100. MEYERS, S. P., and REYNOLDS, E. S. **Occurrence of lignicolous fungi in northern Atlantic and Pacific marine localities.** *Canad. J. Bot.* 38 (2), 1960 (217–26). 14 refs. O.R.S.

When *Tilia americana* and *Pinus palustris* panels were submerged at marine sites in Alaska, British Columbia, New Brunswick, Nova Scotia, and Newfoundland, with water temperatures of 0–15° C., later examination showed an abundant and active ascomycetous and deuteromycetous flora. Dominant genera include *Lulworthia*, *Ceriosporopsis*, *Peritrichospora*, *Halosphaeriopsis* and the Imperfect *Piricanda*, *Humicola* and representatives of Helicosporae. Incubation of the panels after initial examination resulted in further attack on the wood and sporulation of additional species. Differences in the dominant fungus flora between northern and southern environments, especially noticeable in the Deuteromycetes, are discussed.

1101. FRIES, N. **Nonanal as a growth factor for wood-rotting fungi.** *Nature, Lond.* 187 (4732), 1960 (166–7). 7 refs.

It was discovered some years ago [O. Suolahti: unpublished thesis] that volatile substances evaporating from wood of various trees promoted the growth of several wood-destroying hymenomycetes, particularly favouring the development of aerial mycelium. The effect seemed to be correlated with the presence of oleic acid and other unsaturated fatty acids in the woods. The active substance or substances could not be identified. The present author has made experiments in the administration of nonanal and nonanoic acid (known to be formed during the autoxidation of oleic acid) to cultures of several wood-rotting fungi (*Stereum sanguinolentum*, *Daedalea unicolor*, *Polyporus cervinus* and *P. applanatus*). Nonanoic acid had no effect, but nonanal caused an increase in the development of aerial mycelium and sometimes also a faster growth of the substrate hyphae. With *S. sanguinolentum*, the effect of a few other compounds chemically related to nonanal was studied in liquid culture experiments: octanal and decanal produced a slight increase in the rate of growth, whereas nonanol and nonanoic acid proved to be completely inactive.

1102. LYR, H. Die Bildung von Ektoenzymen durch holzzerstörende und holzbewohnende Pilze auf verschiedenen Nährböden. I–IV. **[The formation of ectoenzymes by wood-destroying and wood-inhabiting fungi on various nutrient media.]** *Archiv für Mikrobiologie, Berlin* 33 (3), 1959 (266–82); 34 (2–4), 1959 (189–203; 238–50; 418–33). Many refs. [G.g.] O.R.S.

Presents results of studies on 8 wood-destroying fungi, *Trichoderma viride* and *Chaetomium globosum*, grown in culture with (I) pectin, (II) cellulose, (III) starch and (IV) xylan and glucose as sources of C.

1103. MIZUMOTO, S. **[Studies on *Lenzites abietina* Fr. and some of its allied species XIV. Effect of wood preservative, sodium fluoride and dinitrophenolate upon *L. abietina* Fr., *L. subferruginea* Berk., *L. trabea* (Pers.) Fr. and *L. saepiaria* (Wulf) Fr.]** *J. Jap. For. Soc.* 40 (1), 1958 (12–5). 8 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 20 No. 5261.] The lowest concentration of NaF/DNP mixtures that would inhibit the growth of these fungi on agar was found to be: *L. abietina* and *L. saepiaria*, 0·05%; *L. subferruginea*, 0·06%; *L. trabea*, 0·07%; *P. vaporaria*, 0·08%. Following inoculation, blocks from untreated *Cryptomeria japonica* poles decayed rapidly, with marked loss in weight. Blocks dipped in 2% water solutions of the preservative showed no sign of decay, but dipping in < 1% solution was not effective. Blocks pressure-treated with 1·25% water solution proved highly resistant, suffering little or no loss in weight, whereas blocks immersed in water and dried at room temperature showed considerable decay.

1104. MIZUMOTO, S. **[Studies on *Lenzites abietina* Fr. and some of its allied species. (XVIII). On the resistance of *L. abietina* Fr., *L. subferruginea* Berk., *L. trabea* (Pers.) Fr., and *L. saepiaria* Fr. to low temperature.]** *J. Jap. For. Soc.* 41 (1), 1959 (22–5). 8 refs. [Jap.jap.e.*e.*]

Within the limits of the experiments made, the resistance to low temperatures (< − 5° C.) of the mycelium and basidiospores of *L. abietina*, *L. trabea* and *L. saepiaria* was stronger than that of the mycelium and basidiospores of *L. subferruginea*.

1105. MIZUMOTO, S. **[Studies on *Lenzites abietina* Fr. and some of its allied species. (XIX). The relation of pH of culture media to the growth of *L. abietina* Fr., *L. subferruginea* Berk., *L. trabea* (Pers.) Fr., and *L. saepiaria*.]** *J. Jap. For. Soc.* 41 (9), 1959 (350–3). 13 refs. [Jap.jap.e.*e.*]

Describes experiments demonstrating this relationship. A table showing initial and final pH values,

and graphs plotting the changes in pH and fungal growth, are given.

1106. WAŻNY, J. Badania nad wartością pH grzybni niektórych grzybów niszczących drewno. **[Investigations into the pH values of mycelia of some wood-destroying fungi.]** *Acta Soc. Bot. Polon.* 29 (2), 1960 (315–30). 9 refs. [Pol.pol.e.] O.B.D.

Determinations of pH values were carried out on 20 species of wood-destroying fungus, using the colorimetric method. Different species of fungus when cultivated in the same conditions showed different pH values of their mycelia. The values were not constant and varied to some extent with the strain of the fungus, the state of growth, temperature, nature of the nutrient solution, sugar content, pH of the medium and concentration of fungicides. With increasing age of the culture the pH values of the medium and mycelium decrease but the pH of the mycelium is usually higher than that of the medium. The formation of fruit bodies was accompanied by a rise in pH values. In all instances the pH of the fruit bodies was much higher than that of the mycelium. The pH of the mycelium decreases with increasing temperature and increases with increasing glucose concentration in the medium and with its increasing pH value. An increase in the pH value of the mycelium was also established when the concentration of NaF in the medium increased. *From author's summary.*

1107. GÖTTING, G., LAMPRECHT, L., and HILDINGER, M. Beiträge zur Physiologie des echten Hausschwamms. Zur Kenntnis der Proteinzusammensetzung des echten Hausschwamms. **[The physiology of *Merulius lacrymans*: its protein composition.]** *Archiv für Mikrobiologie, Berlin* 30 (2), 1958 (181–9). 36 refs. [G.g.] O.R.S.

1108. LAMPRECHT, L. Beiträge zur Physiologie des echten Hausschwamms. Über die Verwertung organisch gebundenen Stickstoffs und Kohlenstoffs. **[The physiology of *Merulius lacrymans*: its consumption of organic fixed N and C.]** *Archiv für Mikrobiologie, Berlin* 30 (2), 1958 (190–210). 56 refs. [G.g.] O.R.S.

1109. LIPPE, T. ZUR, and NESEMANN, G. Über die Fruchtkörperbildung von *Merulius lacrymans domesticus* Falck. **[The formation of fruiting bodies by *M. lacrymans domesticus*.]** *Archiv für Mikrobiologie, Berlin* 34 (2), 1959 (132–48). 2 pp. of refs. [G.g.] O.R.S.

Studies the effect of light intensity, temperature and nutrients on formation of fruiting bodies by the fungus grown in culture.

1110. SABADOŠ-ŠARIĆ, A. Ispitivanja utjecaja sterilizacije na otpornost drva prema gljivama truleži. **[Investigation on the effect of heat sterilization on the resistance of wood to decay fungi.]** *Drvna Ind.* 11 (5/6), 1960 (77–8). 3 refs. [Croat.] P.R.

Samples of *Fraxinus angustifolia* [cf. *F.A.* 18 No. 1063] were sterilized by treatment with (*a*) steam at 1–2 atm., for 20 min., or (*b*) dry air at 100–105° C. for 4 hours, and then subjected to attack by *Polystictus versicolor*. Statistically analysed results showed that decay (measured by weight loss) was greater in (*a*) than in (*b*) samples.

1111. SWINFIELD, A. **The maintenance of wooden vessels.** *South Pacific Bulletin, Sydney* 10 (3), 1960 (33–5). L.C.O.

Advice on the prevention of dry rot by the use of resistant or preservative-treated species, good ventilation, good construction, use of salt water for washing down, etc.

845. Attack by Animals

845.1. Marine Borers

See also Nos. 1077, 1099.

1112. NAIR, N. B. ***Polydora* as an agent in the destruction of submerged timber.** *Curr. Sci.* 29 (2), 1960 (61–2). 1 ref. A.P.B.

P. ciliata was found to have settled in fair numbers on Pine test blocks established in part of Bergen harbour and to have made shallow furrows on the surface, giving it a crumbling appearance. This is the first record of an annelid capable of eroding submerged timber in the sea.

1113. OLIVER, A. C., and WOODS, R. P. **The natural resistance of certain timber species to marine borers. Second Progress Report.** *Test Rec. Timb. Developm. Ass., Lond.* No. *B/TR*/3, 1959. pp. 14.

The resistance of 41 timber species to *Teredo* and *Limnoria* attack at Shoreham Harbour, Sussex, is recorded [cf. *F.A.* 21 No. 247]. Eleven species are classified as resistant, a further six being so classified after one year's exposure. A discussion of the biological hazard to timber in U.K. waters is included.

1114. Holzbohrmuscheln (Teredinidae). **[Teredinidae [on the German coast].]** *Holz Roh- u. Werkstoff* 18 (6), 1960 (229–32). 12 refs. [G.] P.R.

An account of the biology, importance, occurrence, identification, boring action, mode of life, control, etc. of Teredinidae on the North Sea and Baltic coasts of Germany.

1115. HURLEY D. E. **The growth of teredo (*Bankia australis* Calman) in Otago harbour.** *N.Z. J. Sci.* 2 (3), 1959 (323–38). 15 refs.

Wooden test blocks [of *Dacrydium cupressinum* and Douglas Fir] were used over a 14-month period. Analysis by radiography showed no teredo in one-month blocks throughout the period; it is considered that immersion for two months is necessary to induce settlement by teredo. Animals were detectable after two months' immersion and a moderately heavy infestation was visible at three months. Spawning seemed to stop for a month or two in mid-winter when harbour temperatures dropped to 5·2° C., but there were signs of new infestation in August. Coatings of fouling organisms (ascidians, algae, hydroids etc.) appeared to inhibit settling of teredo. Ultimate size [upper limit of growth] of teredo is affected by population density [in relation to size of block]. *From author's summary.*

1116. NAGABHUSHANAM, R. **A note on the efficacy of antifouling paints in protecting wood against marine wood-borers.** *Sci. & Cult.* 25 (9), 1960 (529–30). 3 refs. E.M.B.

Presents tabulated results of tests of 12 commercial paints on wood of *Myristica fragrans*. Paints under the trade names Chromite Yellow, White Lead and Stone Colour gave 8 months' protection, whereas controls were riddled in 2 months.

845.2. Terrestrial Borers

See also Nos. 759, 776, 825 *et seq.*, 1077.

1117. MAYNÉ, R., and DONIS, C. Hôtes entomologiques du bois. I. Espèces relevées à Yangambi. **[Wood-infesting insects. I. Species collected in Yangambi.]** *Publ. Inst. Nat. Étude Agron. Congo Belge (Sér. sci.)* No. 83, 1960. pp. 116. 50 refs. [F.]

Describes 28 of the most important commercial tree species, indicating the physical properties and principal uses of the wood, and gives tabulated data, arranged systematically under insect families and genera, showing which insects are found on the various hosts (mostly in the form of felled timber).

1118. MARTÍN DIÉGUEZ, J. La carcoma de la madera y métodos para combatirla. (Anóbidos dañinos en muebles y construcciones.) **[Woodworm and methods of controlling it. (Anobiidae damaging furniture and structural timbers.)]** Servicio de Plagas Forestales, Dirección General de Montes, Cazas y Pesca Fluvial, Ministerio de Agricultura, Madrid. 1960. pp. 56. 49 refs. [Span.]

Presents information on (1) the family Anobiidae, with detailed descriptions of 7 species and notes on type of damage, and (2) methods of control and prevention.

1119. MATHUR, R. N. **Timber pests and their control in houses.** *Indian For.* 86 (6), 1960 (374–80 + 5 photos). 7 refs.

Covers powder-post beetles, termites, and (more briefly) *Stromatium barbatum* and *Xylocopa* spp.

1120. **Powder post beetles: the powder post beetles of major importance in Nigeria; natural enemies of powder post beetles [in Ghana and Nigeria].** *Extr.* from *Rep. W. Afr. Timb. Borer Res. Unit 1958/59*, 1960 (9, 27, 41–3).

1121. **An examination of the starch content in standing and felled trees.** *Extr.* from *Rep. W. Afr. Timb. Borer Res. Unit 1958/59*, 1960 (9, 28–9).

Starch contents were estimated in standing and felled trees of *Triplochiton scleroxylon* in Jan.-Oct. 1959. The felled trees were left in the forest with the bark on. In standing trees, there was little variation in starch contents between different heights above the ground or trees of different girth, but considerable seasonal variation; all 20 trees showed a fall in starch, generally in May, sometimes in March–July, before the appearance of new leaves, and there is some evidence of a second fall in starch content in Nov.–Dec. The 10 felled trees (all 10 ft. in girth) showed considerable individual variation in the rate at which the sapwood became starch-free. Two were practically starch-free in the exposed upper surface of the trunk in 6 months, whereas most of the others still had large quantities of starch after 10 months; in all trees, starch disappeared in patches over the surface owing to varying degrees of exposure to the weather. Three barked logs were brought from the forest 2 months after felling, and flat-sawn into boards which were stacked in a timberyard at Kumasi. On their arrival in January, all logs had high starch content and 20% moisture content. By June, starch had disappeared from large areas of the surface layers of all logs and the m.c. was 11%; and by October regions of high starch content were very localized and m.c. was 8%. The first signs of attack by powder-post beetles (*Heterobostrychus brunneus* and *Minthea obsita*) were found in June. In trials in the insectary, *Bostrychoplites cornutus* failed to establish itself in samples of the sapwood in the first 3 months after the logs were brought in.

1122. WRIGHT, C. G. **The influence of several environmental factors on the development of the southern lyctus beetle, *Lyctus planicollis* Leconte.** *Ann. Ent. Soc. Amer.* 52 (5), 1959 (632–4). 5 refs. O.R.S.

In a laboratory experiment to determine the effect of wood species, method of seasoning and light on the rate of development and number of emerging adults of *L. planicollis*, sections of sapling wood were placed in jars, each with 5 ♂ + 5 ♀ beetles to breed on the material. The tests included: (*a*) air-dried Red Oak maintained in 15 hr. of light daily; (*b*) as (*a*), but in darkness; (*c*) heat-dried Red Oak, 15 hr. light; (*d*) as (*c*) but in darkness; (*e*) heat-dried White-Oak, 15 hr. light daily. The first ♂ emerged from (*a*) in 69 days and the first ♀ from (*c*) in 68 days; emergence of both sexes from all groups was noted during the next 9 days. Mean number of adults emerged per jar after 38 weeks was (*a*) 172·3, (*b*) 85·9, (*c*) 50·4, (*d*) 55·3, (*e*) 42·3. No conclusions were drawn as to the effect of light or darkness on the number of emerging adults. Determination of the mean moisture content of uninfested controls showed that air-dried Red Oak maintained a slightly higher m.c. than other variants; this may have an influence on the greater total of adults emerging from (*a*) and (*b*).

1123. **Prevention of *Lyctus* attack in sawn hardwoods by use of 'contact' insecticides.** *Leafl. For. Prod. Res., Lond.* No. 43 (rev.) 1960. pp. [3].

[Cf. *F.A.* 17 No. 4520.] Emphasizes the purely preventive nature of the spraying and dipping treatments described, giving details of the costs and concentrations of DDT, BHC, and dieldrin required. The application of these 'contact' insecticides in conjunction with kiln sterilization [cf. *F.A.* 18 No. 3459] is mentioned, and their effectiveness with *Phymatodes testaceus* and *Hylotrupes bajulus* also discussed.

1124. TAYLOR, J. M. **Prevention of *Lyctus* attack in sawn timber.** *Timb. Technol.* 68 (2253), 1960 (262–3, 273). 11 refs.

Boards of *Quercus robur* were protected from attack by *L. brunneus* for 3 years when dipped for 10 sec. in emulsions of DDT (2 and 1%), BHC (1 and 0·5% γ isomer), or dieldrin (1 and 0·5%).

The deposit obtained by this treatment is ca. 3·4 lb. emulsion (0·34 gal.) per 100 sq. ft. surface area; it is superficial and is removed by planing. Therefore, when laying down new stock of *Lyctus*-susceptible hardwoods to be held for a number of years, it may be advisable to dip the boards before stocking, especially if the timber will not be easily accessible for spraying.

1125. NOUR, H., and SIDAROUS, F. **The effectiveness of certain insecticides on lyctid powder-post beetles with special reference to *Trogoxylon impressus* Comolli, family Lyctidae-Coleoptera** *Agricultural Research Review, Cairo* 36 (1), 1958 (150–4). [E.e.] I.I.E.

Tabulates the results of tests made on *T. impressus* in Oak boards in 1956 to study the initial and residual effects of various solutions of DDT, PCP, lindane [γBHC], toxaphene, dieldrin, creosote, and paradichlorobenzene in kerosene.

1126. HOLM, C., and EKBOM, P. **The significance of the house longhorn beetle as a destroyer of buildings and its control.** *Tied. Valt. Tekn. Tutkimusl.* (*Sarja 3–Rakennus*) No. 22, 1958. pp. 44. P.R.

Contains sections on: description and history; general spread; occurrence in Finland; Finnish investigations (on extent of damage, economic depreciation of wooden buildings, rate of spread in a building, effect of humidity and temperature on rate of spread, and manner of spread, e.g. by flight or by transfer with furniture, etc.), and methods of control in Finland and elsewhere.

1127. BAKKE, A. **On the house longhorn beetle, *Hylotrupes bajulus* L. (Col. Cerambycidae) in Norway.** *Medd. Norske Skogforsøksv.* 16 (4), No. 56, 1960 (263–79). 18 refs. [E.nor.]

A historical review and notes on its present status and damage inside buildings and to telegraph poles, with discussion on its distribution in Norway, which occurs, unlike that in Sweden, in the more humid, Atlantic areas.

1128. KÖRTING, A. Durch Hausbockbefall bedingte Gewichtsminderungen des Holzes als Kriterium für die Stärke der Fresstätigkeit. **[Reductions in weight caused by *Hylotrupes bajulus* attack as a criterion for [assessing] the degree of destruction.]** *Holz Roh- u. Werkstoff* 18 (5), 1960 (167–70). 6 refs. [G.g.e.] P.R.

Small blocks of Spruce, with bark, were each exposed to attack by a single *H. bajulus* larva, of various weights, for some 9 months, and then weighed. A relation was found between weight loss of the wood and the extent of destructive larval activity, and the possibilities of using this criterion in laboratory investigations are discussed.

1129. DOMINIK, J. Z doświadczeń nad chemiczym zwalczaniem w drewnie żerdzianki sosnówki (*Monochamus galloprovincialis* Ol.). **[Chemical control of *M. galloprovincialis* inside wood.]** *Sylwan* 104 (4), 1960 (11–5). 2 refs. [Pol.russ.e.]

The surfaces of barked Pine poles (10–14 cm. diam.) attacked by the larvae were coated with 6 different preparations [cf. *F.A.* 20 No. 4927]. Azotox 40% gave 100% kill, and Tetra 3 nearly 100%. The other preparations were less effective.

1130. MAYR, F. Ein neues Stammschutzmittel gegen Rinden- und Holzbrüter. **[A new log-spray against bark- and wood-beetles.]** *Allg. Forstzeitschr.* 15 (32), 1960 (452–3). [G.]

Tests with the 'Linz' log spray of Austrian manufacture, an oily BHC emulsion that penetrates the bark and kills both bark and wood breeders (including *Trypodendron lineatum*, which cannot be controlled by barking) indicated that one spraying in spring protected logs until the autumn. For prevention, 20–30 litres/ 100 cu.m., diluted 1/4 in diesel oil, is recommended; for infested logs, the same dosage diluted 1/9 for better penetration. Costs are stated to be about equal to those of barking at felling.

1131. BAKKE, A. Insektskader på ubarket gran- og furutømmer i Norge. **[Insect damage to unbarked Spruce and Pine timber in Norway.]** *Medd. Norske Skogforsøksv.* 16 (4), No. 56, 1960 (281–333). 15 refs. [Nor.nor.e.]

Describes the damage caused by, and discusses the distribution, biology, etc. of, insects causing direct damage to the wood (*Monochamus sutor*, *Trypodendron lineatum*, and various Siricidae), those associated with blue-stain fungi (*Blastophagus minor*, *Ips acuminatus*, *I. typographus*, and *T. lineatum*), and a variety of insects occurring under the bark and causing no direct damage, but responsible indirectly for e.g. fungus damage and checking (as a result of loosening of patches of bark and exposure of the wood beneath). Experiments on spraying Pine logs, already briefly reported [see *F.A.* 21 No. 5068], are described in more detail.

1132. **Relative susceptibility of commercial timbers to attack by ambrosia beetles [in Nigeria].** *Extr.* from *Rep. W. Afr. Timb. Borer Res. Unit 1958/59*, 1960 (21–2).

Includes a table showing 32 species arranged in order of susceptibility to attack, based on results from Ibadan, Nikrowa and Kumba, typifying different forest types and amounts of rainfall (observations were made on 2-ft. billets 6 weeks after felling). [Cf. *F.A.* 20 No. 5273.]

1133. **Control measures against the attack of floating logs by ambrosia beetles.** *Extr.* from *Rep. W. Afr. Timb. Borer Res. Unit 1958/59*, 1960 (9, 25–6).

In a pilot trial, in which 12 rafts of 4 treated logs each were left floating for 12 weeks in May–August, a paint containing γBHC was very promising, giving 96% protection over the period. Grease formulations usually came off in the water. Aldrin was next most successful after γBHC, and malathion gave negligible protection.

1134. **The control of ambrosia beetle attack in logs.** *Timb. Leafl. For. Dep. Uganda* No. 37, [1960?] pp. [4]. 1 ref.

Examines briefly the nature of ambrosia-beetle damage, and discusses the effectiveness of various proprietary insecticides, particularly BHC solutions

made up in oil or water for spraying logs. A table taken from a previous paper [see *F.A.* 21 No. 2485] comparing the effect of BHC with untreated controls, is included.

1135. SCHNEIDER, I. Untersuchungen über die Aktivitätsgrenzen von pflanzlichen und tierischen Importholzschädlingen. **[Limiting conditions [of temperature and humidity] for plant and animal pests of imported timbers.]** *Repr.* from *Mitt. Dtsch. Ges. Holzforsch.* No. 46, 1959 (8–12). 3 refs. [G.]

In laboratory experiments with *Xyleborus mascarensis* and its associated (unidentified) blue-stain fungus found in the sapwood and heartwood of a Makore (*Mimusops heckelii*) log, boring activity rose steeply from ca. 8° C. to a maximum at 27°, and declined steeply after 30°. The number of live young beetles emerging was also greatest at 27°. Swarming occurred at 24°. Activity decreased with decreasing moisture content of the wood. Growth of the fungus took place between 8° and 35° (optimum 27–30) and between 120 and 30% m.c. (optimum 90–100%). Both beetles and fungus find favourable conditions in the holds of boats on the African voyage. Storing on deck when possible, or adequate ventilation to promote drying, are suggested as preventive measures.

1136. HURD, P. D., JR. **Observations on the nesting habits of some new world carpenter bees with remarks on their importance in the problem of species formation. (Hymenoptera : Apoidea).** *Ann. Ent. Soc. Amer.* 51 (4), 1958 (365–75). 54 refs. O.R.S.

Reviews the literature on the genus *Xylocopa*, gives new biological information on 8 American species, discusses the importance of nesting habits in determining ancestry, origin, dispersal and species formation, and warns against further accidental introduction to new geographic areas of species known to attack structural timber.

845.3. Termites

See also No. 1119.

1137. MORGAN, F. D. **The ecology and external morphology of *Stolotermes ruficeps* Brauer (Isoptera : Hodotermitidae).** *Trans. Roy. Soc. N.Z.* 86 (1), 1959 (155–95). 18 refs. O.R.S.

A detailed study based on examinations of 450 colonies, of habits, life cycle, habitat, fungus and animal associations, economic significance (*S. ruficeps* requires wood of high moisture content and with very rare exceptions attacks only rotten wood), and external anatomy.

1138. MATHUR, G. C. [Editor]. **Technical Information Series—14. Termites and termite proofing.** National Buildings Organisation, Ministry of Works, Housing and Supply, New Delhi. 1960. pp. 16. 81 refs. P.R.

Briefly describes the biology of termites, and the indications of their presence in structural timbers, their development in colonies, and the conditions favourable for their attack. A list of timbers recommended for construction and classified according to their durability is given, and various preservative treatments discussed. An extensive bibliography is appended.

1139. HRDÝ, I., and HRDÁ, J. Srovnání účinnosti DDT a γHCH na termity *Kalotermes flavicollis* a *Reticulitermes lucifugus.* **[Effect of DDT and γBHC on *K. flavicollis* and *R. lucifugus*.]** *Zool. Listy, Brno* 9 (3), 1960 (209–15). 13 refs. [Cz.E.] O.R.S.

In laboratory tests, *K. flavicollis* was more resistant to the insecticides than *R. lucifugus*. γBHC was more effective against both species and took effect more rapidly than DDT.

1140. SCHULTZE-DEWITZ, G. Termitenresistenzprüfung von sieben Exotenhölzern. **[Termite resistance tests on seven exotics.]** *Holz-Zbl.* 86 (99), 1960 (1379). 10 refs. [G.]

In tests with small specimens of 25–30% moisture content [not stated whether heart- or sapwood] buried in garden soil and exposed, separately, to 1000 workers of *Reticulitermes lucifugus* for 4 weeks at 26° C., *Cedrela toona, Afzelia pachyloba, Chlorophora excelsa*, and Teak from Indonesia and Siam had weight losses of only 1–3·3%, and all termites died. *Cedrus deodara* lost 31% and German-grown Redwood 46% in weight, and ≥ ¾ of the termites survived.

846. Steaming

1141. ŁAWNICZAK, M. Badania nad odkształceniami i relaksacją naprężeń w parowanym drewnie bukowym. **[Creep and stress relaxation in steamed Beech.]** *Prace Inst. Tech. Drewna* 5 (1), 1958 (61–81). 7 refs. [Pol.pol.russ.e.] P.R.

Gives results of investigations on the effect of steam pressure and steaming time on the magnitude of the increase in deflection in specimens under constant load, on stress relaxation in bent specimens during drying, and on permanent deformation [cf. *F.A.* 16 No. 3375].

847. Drying (Seasoning)

See also No. 1122.

1142. GONET, B., KRZYSIK, F., and SZMIT, J. Wpływ jesienno-zimnowej wyróbki drewna na przebieg wysychania i nasycalność bukowych podkładów kolejowych. **[The effect of autumn/winter felling on the seasoning and impregnation of Beech sleepers.]** *Sylwan* 104 (4), 1960 (1–9). 1 ref. [Pol.russ.e.]

As earlier tests [cf. *F.A.* 21 No. 5083] showed that the period April–Sept. was too short to reduce sleeper m.c. below 26·5%, another trial was made in which trees were felled in late Sept. 1953, converted into sleepers in Dec., seasoned until mid-Oct. 1954, and then creosoted by the double Rüping method. Results showed that this longer period of seasoning did not reduce m.c. below 26%, and these sleepers absorbed 14% less creosote than those seasoned from April to Sept.

1143. HEADLEE, T. M. **Should I roof my lumber?** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 171, 1960. pp. 5. 2 refs.

An air-drying study on *Liriodendron tulipifera* in spring and summer in S. Illinois indicated that by reducing degrade (particularly warping and blue-stain), roofs made of corrugated steel on wood

frames were profitable when used with high-grade lumber, but not with lower grades. [Cf. *F.A.* 20 No. 5290.]

1144. Milovidov, S. G. **Clamping sawn timber for drying.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4516, 1959. pp. 1 + 1 drawing. Transl. by M. Slade from *Derev. Prom.* 7 (6), 1958 (22). [See *F.A.* 20 No. 2526.] Limited distribution.

1145. Bollman, L. **Wood drying with and without fans: heat balance and economy.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4621, 1959. pp. 15 + 2 tbls. 10 refs. Transl. by J. Hardy from *Holz-Zbl.* 83 (125), 1957 (1521–4). [See *F.A.* 19 No. 2472.] Limited distribution.

1146. Rietz, R. C. **Kiln drying of Engelmann Spruce.** *Rep. U.S. For. Prod. Lab., Madison* No. 1944–6 (rev.) 1960. pp. 5 + 9 photos, 5 tbls. P.R. [Cf. *F.A.* 16 No. 1152.]

1147. Malmquist, L., and Noack, D. Untersuchungen über die Trocknung empfindlicher Laubhölzer in reinem Heissdampf (ungesättigter Wasserdampf) bei Unterdruck. **[Studies on drying refractory hardwoods in pure superheated steam at pressures below atmospheric pressure.]** *Holz Roh- u. Werkstoff* 18 (5), 1960 (171–80). 28 refs. [G.g.e.] P.R.

Describes the experimental vacuum drier used in experiments on Oak and Beech, and the experiments themselves, using superheated steam at pressures from 760 to 150 mm. Hg. Under equal temperature conditions, drying in superheated steam was not only quicker than normal kiln drying at atmospheric pressure but also caused less degrade. The influence of the wet-bulb temperature on the drying time was nearly independent of wood species and drying method. It is concluded that vacuum kilns will be advantageous as they will allow species sensitive to temperature variations to be dried with superheated steam at sub-atmospheric pressures, and species insensitive to temperature to be dried with superheated steam at pressures in excess of atmospheric.

1148. Dittman, J. R., and Smith, H. H. **Lumber drying and quality control of moisture content in kiln-dried lumber.** *For. Prod. J.* 10 (7), 1960 (353–7). 10 refs.

Tests with self-recording electronic moisture meters on lumber of White Fir (*Abies concolor* and *A. magnifica*) showed considerable fluctuations in final m.c., emphasizing the need to segregate as much as possible the various types of wood they contain, known in the trade as 'cork' (heartwood from the upper part of the tree; mean m.c. in these tests 55%), 'sap' (m.c. 170%) and 'sinker' (heartwood from the butt end; m.c. 181%). Tests with *Pinus ponderosa* showed that bulk storage of dried lumber equalized m.c.'s.

1149. Smith, H. H., and Dittman, J. R. **Effect of solid storage on the uniformity of final moisture content of kiln dried lumber.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 162, 1960. pp. 5.

Bulk storage of kiln-dried 5/4 Ponderosa Pine Shop and Better lumber greatly improved moisture distribution within boards rejected as too wet. After 1 week of storage 92%, and after 2 weeks 96% of the boards were acceptable.

848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 606, 1073, 1149.

1150. Lane, P. H., and Scheffer, T. C. **Water sprays protect hardwood logs from stain and decay.** *For. Prod. J.* 10 (6), 1960 (277–82). 8 refs.

Spraying from mid-April in Wisconsin, even if intermittent (6- to 12-hour cycles) or partial (ends only), kept unbarked winter-cut veneer logs of *Betula papyrifera, B. lutea, Acer saccharum* and *A. saccharinum* free from rot and fungus stain, and greatly reduced chemical stain. In controls, rot extended 7–10 in. and stain 21–42 in. from each end. The condition of the logs was good even when spraying was delayed until July. Temperatures in the stacks were reduced by ca. 7° F.

85. Grading of Wood and Wood Products

851. Timber Quality in General

See also Nos. 516, 916, 921, 957.

1151. Nicholls, J. W. P., and Dadswell, H. E. **Project W.S.18–2, Progress report No. 1. Assessment of wood qualities for tree breeding in *Pinus radiata* D. Don from the Australian Capital Territory.** Division of Forest Products, C.S.I.R.O., S. Melbourne, Australia. 1960. pp. 12 + 2 gphs., 3 tbls. 13 refs. Limited distribution.

[Cf. *F.A.* 21 Nos. 2505–6.] Specimens from 29 trees of *P. radiata* selected as plus trees for breeding purposes, were examined. The variation, through successive growth rings from the pith, of such features as cell length (c.l.), micellar angle (m.a.), basic density (b.d.), ring width (r.w.), % late wood, longitudinal shrinkage (l.s.), spiral grain, and cellulose content was measured. Statistical analysis revealed significant correlations between c.l. and m.a., cellulose content, l.s., r.w. and b.d., and also between b.d. and both r.w. and % late wood. On the basis of these relationships and similar results for *P. elliottii*, it is concluded that c.l. and b.d. furnish a reliable guide to wood characteristics in the species. It is recommended that the selective criteria be greater than average c.l., and greater than average b.d. Using the sum of these two features, 13 of the 29 trees were rejected,and another 2 because of the excessive angle of spiral grain. The future requirements for maximum benefit to be realized from the selection method adopted are outlined. *From authors' summary.*

1152. Nicholls, J. W. P., and Dadswell, H. E. **Project W.S.18–2, Progress report No. 2. Assessment of wood qualities for tree breeding in *Pinus radiata* D. Don from Tasmania.** Division of Forest Products, C.S.I.R.O., S. Melbourne, Australia. 1960. pp. 8 + 3 gphs. 4 refs. Limited distribution.

By applying the conclusions reached in the previous report [see preceding abstract], the wood

quality of 11 *P. radiata* plus-trees was assessed on the basis of c.l. and b.d. The results obtained suggest that 7 trees should be rejected, and another eliminated because of excessive spiral grain. The results from these Tasmanian trees and from trees grown in the Australian Capital Territory are compared. *From authors' summary.*

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 804, 1062.

1153. BERNHART, A. Untersuchungen über die Astigkeit von Fichten aus dem Bayerischen Wald. **[Knottiness of Spruce from the Bayerische Wald.]** *Abstr.* in *Berichte aus der land- und forstwirtschaftlichen Forschung, Bad Godesberg* 6, *Suppl.* No. 1, 1959 (11–2). [G.]

The size, height above ground, and orientation of dead branches on five stems from an 85-year-old and five from a 110-year-old stand indicated that natural pruning was unsatisfactory. Stubs of dead branches started 2–4 m. above ground. Their size increased with height, but generally, except with early and continuing release,did not exceed 20 mm. in diam. (the grading limit for small knots) in the first 15 m. It is thought that only pruning could improve the quality of the lowest third of the stem.

1154. **Timber utilization [: effect of spiral grain on building timber].** *Extr.* from *Rep. Dep. For. S. Afr. 1957/58*, 1960 (11–2).

To determine whether the spirality limit of 7°, measured at b.h. on the growing tree [cf. *F.A.* 15 No. 888], was sufficient to ensure good-quality building material, a test was carried out on 2000 cu. ft. of *Pinus roxburghii* (*P. longifolia*) from the E. Transvaal. It was found that 96% of building material sawn from trees with a spirality of $\leqslant 7°$ fell within the limits allowed by the existing grading rules of the Bureau of Standards, and 74% was 1st or 2nd grade. Of the rejected boards 87% contained heartwood, which proves how important it is that heartwood be discarded as far as possible when cutting building material. In a comparative study on *P. patula* sawlogs, 88% of boards were graded 1st or 2nd class, according to the amount of warp present. An investigation of the influences of changes in m.c. on the twist of *P. patula* building timber showed that, with an 11–12% m.c., the twist was twice as much as with a m.c. of 16%.

1155. BURGESS, H. J. **Some notes on brittle heart and the possibility of using it as a structural material.** *Res. Pamphl. For. Res. Inst. Kepong* No. 28, 1960. pp. 16. 30 refs.

[Cf. *F.A.* 20 No. 1195.] The appearance and nature of brittle heart are discussed, and a summary is given of investigations in other countries, which might indicate its cause. From the evidence presented it is concluded that, as already concluded by Australian authorities, brittle heart is caused by internal growth stresses in the living tree. The nature and distribution of these stresses is examined and suggestions are made for additional work of this kind. Notes on the utilization of brittle heart timber conclude that it may be used in structural members when reinforced with sound timber, and calculations show the approach that would have to be made in the rational design of such members. *Author's summary.*

1156. GOEBEL, N. B., TARAS, M. A., and SMITH, W. R. **Tension wood and its relation to splitting in Hickory.** *Bulletin of the South Carolina Agricultural Experiment Station, Clemson* No. 480, 1960. pp. 21. 13 refs.

The average area occupied by gelatinous fibres on 4 radii (at 90° intervals) on disks cut from the butt logs of 19 'splitters' (*a*), was significantly higher than that on disks from 18 non-splitters (*b*). Nearly half of (*a*) but none of (*b*), had gelatinous fibres on all 4 radii, although some (*a*) disks had $< 2\%$ and some (*b*) $> 20\%$ gelatinous fibres. Sectional anslysis of a straight-grown (*a*), a straight (*b*) and a (*b*) with a 6% lean showed amounts of 34, 6, and 16% respectively, distributed over the whole stem in (*a*) and largely concentrated on the upper side in the leaning tree [cf. *F.A.* 20 No. 950].

1157. CLARK, W. P. **Cottonwood troublemaker. Tension wood causes difficulty in seasoning and machining.** *Sth. Lumberm.* 201 (2505), 1960 (31 . . . 34).

Lumber sawn from an Eastern Cottonwood tree with a lean of 7° was air-dried for 9 months, examined for warping and variation in m.c., kiln-dried, re-examined, and then machined. Bowing in kiln-dried lumber was significantly greater in boards from the tension side of the tree. More collapse was noted in kiln-dried than in air-dried lumber, largely associated with the presence of tension wood. After planing, areas of projecting fibre were much more prominent on tension-wood boards than on normal boards.

1158. STRÜBING, J. Über Möglichkeiten und Entwicklungsversuche zur Prüfung von Furnieroberflächen. **[Possibilities and developments in testing surface quality in veneer.]** *Holz Roh- u. Werkstoff* 18 (5), 1960 (181–5). 5 refs. [G.g.e.]

Discusses various American, Japanese and German methods of testing, and particularly future developments in continuous non-destructive (electrical, ultrasonic, and radiation) methods.

1159. KIKATA, Y., and HIRAMATSU, I. **[Studies on surface roughness of wood. III. Shape of dents on the surface of wood.]** *J. Jap. Wood Res. Soc.* 5 (4), 1959 (138–43). [Jap.jap.e.*e.*] P.R.

[Cf. *F.A.* 20 No. 5311.] Presents fully tabulated results of investigations on the surface roughness of (1) planed, and (2) sawn, samples of *Fagus crenata*, *Fraxinus mandshurica* var. *japonica*, *Shorea* sp., and *Cryptomeria japonica*. In (1), substantial primary roughness due to wood structure was observed and measured, viz. the tracheid indentations in *C. japonica*, and vessel indentations in the other 3 species. In (2), the authors distinguish two types of surface roughness caused by circular saws: (i) large, coinciding with one blade-revolution (in *F. mandshurica* this is not apparent, owing to marked raising of the wood fibres); and (ii) small, caused by each tooth,

but since the tooth cut is distributed by ray tissues the cut becomes discontinuous. Extensive tabulated data are included on the saws used, their working speeds, set, etc., for each species tested.

853. Grading of Wood in the Rough

See also Nos. 921, 974.

1160. SNELLMAN, G. O. **Timber grading, past and present.** *Timb. Tr. J.* 234 (4375; 4376), 1960 (70–1; 88*A*–88*D*). Transl. from *Pap. ja Puu* 42 (5), 1960 (327–42). [See *F.A.* 21 No. 5100.]

1161. LARSON, N. G. **Grading logs and trees for quality. A bibliography compiled for the Log Grade Committee of the Forest Service.** Forest Service, U.S. Department of Agriculture, Washington. 1959. pp. 11.

Cites 85 references from U.S. literature.

1162. BETHEL, J. S., and HART, C. A. **Techniques for the development of a rational grading system for hardwood veneer logs.** *For. Prod. J.* 10 (6), 1960 (296–301).

Describes alternative methods of veneer sampling and outlines a programme for mechanical card-sorting to relate log characteristics (species, size, shape, defects) to yields of clear veneer of varying length and width.

854. Grading of Converted Timber

See also No. 1160.

1163. KEYLWERTH, R. Statistische Methoden der Qualitätskontrolle im Holzindustriebetrieb. **[Statistical methods of quality control in wood industries.]** *Mitt. Dtsch. Ges. Holzforsch.* No. 44, 1957 (1959). pp. 49. 24 refs. [G.] P.R.

A general discussion of techniques and uses, based largely on American literature, with examples on the control of dimensions and quality, moisture content etc. of sawn boards, veneers, blockboards, and particle boards, waste and cull percents, etc.

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

861. Pulp and Paper Manufacture. Textile and other Cellulose Derivatives

See also Nos. 324, 964, 966, 994, 1053, 1071, 1073, 1255.

1164. LINKHART, R. **Utilization of sawdust in continuous pulping.** *For. Prod. J.* 10 (7), 1960 (341–3).

Describes the production, in continuous digesters, of high-quality, easy-bleaching pulp by the kraft process, using sawdust, shavings, veneer waste and fines screened from chips. The sawdust pulp is very useful as filler stock.

1165. KUBELKA, V., *et al.* **Utilization of branches and forest waste for the production of pulp.** *Papir a Celulosa* 15, 1960 (59–63). [Cz.?] From *abstr.* in *Chem. Abstr.* 54 (12), 1960 (12578). P.R.

Describes the difficulties encountered in pulping a very short-fibred, non-homogeneous material of the sort considered, yielding 35–40% kraft pulp that is darker and less strong than normal wood pulp [unspecified].

1166. FAHEY, D. J., *et al.* **Milk cartons from certain Lake States softwoods and hardwoods.** *Rep. U.S. For. Prod. Lab., Madison* No. 2187, 1960. pp. 13 + 6 tbls. P.R.

Describes pulping experiments made in co-operation with the Michigan College of Mining and Technology, Houghton, to evaluate the suitability of several common Lake States hardwoods and softwoods, viz. Aspen, Sugar Maple, Eastern Hemlock, Balsam Fir, Jack Pine, and American Beech, for making milk cartons.

1167. MCKEE, J. C. **The kraft pulping of small diameter Slash Pines.** *Tappi* 43 (6), 1960 (202*A*–204*A*). P.R.

Gives results of a study on (*a*) the quality of *Pinus elliottii* pulpwood < 4 in. in diam. compared with that of normal size; (*b*) the prospects of developing economical harvesting and processing methods for the small wood.

1168. CHITTENDEN, A. E., and PALMER, E. R. **Pulping trials on three species of Pine from Mauritius.** *Trop. Sci., Lond.* 2 (1/2), 1960 (82–9).

Experiments were made on samples of *Pinus elliottii*, *P. taeda*, and *P. tabulaeformis* var. *densata*. The pulps obtained from the first two were very similar to those obtained from *P. elliottii* from the U.S.A. Pulps obtained from *P. tabulaeformis* var. *densata* were very similar to those from *P. caribaea* from British Honduras and might safely be used in admixture with *P. elliottii* and *P. taeda* to produce a pulp very like the average commercial 'Southern Pine' pulp.

1169. SCHAFER, E. R., HYTTINEN, A., and MARTIN, J. S. **The groundwood and sulfate pulping of pole-blighted and healthy Western White Pine.** *Rep. U.S. For. Prod. Lab., Madison* No. 2185, 1960. pp. 6 + 7 tbls. P.R.

Describes and discusses groundwood and sulphate pulping experiments made on wood from healthy and pole-blighted *Pinus monticola*, and presents data on the physical characteristics of the woods. Good-quality pulps can be made from both types, those made from the healthy wood being slightly higher in strength on the average.

1170. BHAT, R. V., *et al.* **Chemical pulps and writing and printing papers from sabai grass (*Eulaliopsis binata* Retz.).** *Indian For.* 86 (7), 1960 (423–31 + 3 sample sheets). 1 ref.

Describes in detail laboratory experiments on the production of chemical pulps (soda and sulphate processes), their bleaching and preparation of writing and printing papers.

1171. VALENTE, H. M. Caña 'coligue' (*Chusquea culeou* E. Desvaux) materia prima para papel. **[*C. culeou*, a raw material for pulping.]** *Notas tecnol. for. Adm. Nac. Bosques, B. Aires* No. 2, 1960. pp. [4]. 4 refs. [Span.]

Presents data on (1) weight and % of nodes and

internodes in the samples, (2) the chemical composition of nodes and internodes, and of the whole cane, and (3) a comparison of fibre dimensions and chemical composition with those of 4 other well known pulping species. Its yield of α-cellulose is rather lower, but its pentosan content is noticeably higher than in these, and by virtue of this high pentosan content, it could prove a useful raw material for pulping or for the production of furfural.

1172. NAFFZIGER, T. R., *et al.* **Dissolving pulps from domestic timber Bamboo—*Phyllostachys bambusoides*.** *Tappi* 43 (6), 1960 (591–6). 22 refs. P.R.

Discusses the use of dry *P. bambusoides* ≯ 15 years of age from Savannah, Ga., as raw material for the preparation of dissolving-grade pulps by prehydrolysis and sulphate pulping techniques [described], and presents tabulated data showing the influence of condition of the raw material and the variables in the hydrolytic treatment upon the yield and characteristics of the pulps under constant pulping and bleaching conditions.

1173. GREMLER, E. R., and MCGOVERN, J. N. **Low-power cold soda pulping.** *Tappi* 43 (8), 1960 (200*A*–205*A*). 4 refs. P.R.

Reviews briefly the history of cold soda pulping, emphasizing the various continuous methods used. Pulping data on Aspen, Birch, Oak, *Bambusa polymorpha*, and a hardwood mixture suggest that short impregnation periods and low h.p. result in completely defibrated pulp at high freeness. The principle of a new defibrating machine, the Chemifiner, and its contribution to the process described, are explained.

1174. ISTAS, J. R., and RAEKELBOOM, E. L. Étude papetière du mélange *Musanga cecropioides-Bambusa vulgaris*. **[Paper-making from a mixture of *M. smithii* and *B. vulgaris*.]** *Bull. agric. Congo belge* 51 (2), 1960 (393–402). 12 refs. [F.f.du.]

Describes experiments on the pulping of the two species in mixture (*a*) or separately (*b*), and on papers made from (*a*) or by mixing the (*b*) pulps. Concludes that (*a*) has sufficient advantages to justify further research on sulphate pulping of a mixture of bamboo and wood.

1175. CHITTENDEN, A. E., EDWARDS, E. E. L., and PALMER, E. R. **Pulping trials on *Ricinodendron rautanenii* timber from Northern Rhodesia.** *Trop. Sci., Lond.* 2 (1/2), 1960 (72–81). 4 refs.

[Cf. *F.A.* 19 No. 3604.] All the samples here reported on, whether treated with fungicide or not, were attacked by a sapstain fungus. It would appear, therefore, that fungus-free samples of this timber are very difficult to obtain. The infection, tentatively identified as caused by *Ceratocystis moniliformis* (syn. *C. wilsoni*) resulted in very low yields of dark-coloured pulp. Since the timber is attacked with great rapidity, there is the suspicion that the organism may exist in or on the living tree. If, however, the susceptibility of this timber to fungal attack can be overcome, it would show some promise as a source of typical hardwood pulp.

1176. PHILLIPS, F. H., and WATSON, A. J. **Project P.P.17, Sub-project 17–1, Progress report No. 7. Pulping studies on *Anisoptera polyandra* and *Pasania* spp.** Division of Forest Products, C.S.I.R.O., S. Melbourne, Australia. 1960. pp.12. 5 refs. Limited distribution.

Good yields of sulphate pulps with satisfactory strength properties, especially tearing resistance, and of neutral sulphate semichemical pulps were obtained from both woods, the pulps of *A. polyandra* being of better quality in each case. Cold soda semichemical pulping gave low-strength pulps; groundwood pulps were also of poor quality.

1177. TENESCU, S. Användning av bokved och annan lövved för tillverkning av massa i Frankrike. **[The use of Beech and other hardwoods for pulp manufacture in France.]** *Svensk PappTidn.* 63 (14), 1960 (437–46). [Sw.] P.R.

Includes statistics of use of hardwoods for industry and fuelwood, and data on pulping methods and output of hardwood pulp.

1178. NAGATOMO, S. **[Morphological study of Asplund pulp.]** *J. Jap. Wood Res. Soc.* 6 (3), 1960 (98–102). 11 refs. [Jap.e.*e.*] P.R.

Data on the Asplund method of defibrating *Tilia japonica* chips.

1179. DEWHIRST, L. **Sudbrook pulp mill, description and operation.** *Tappi* 43 (6), 1960 (204*A*–211*A*). P.R.

Gives a comprehensive account of the manufacture of neutral sulphite pulp at the new Sudbrook Hardwood Pulp Mill (unique in the U.K.) with details of the handling and sources of the English hardwoods used (mainly Oak, Birch, Beech and Ash).

1180. PEARL, I. A., and BEYER, D. T. **Studies on the chemistry of Aspenwood [*Populus tremuloides*]. V. An investigation of various Aspen spent liquors as sources of *p*-hydrobenzoic acid and other compounds.** *Tappi* 43 (6), 1960 (568–72). 8 refs. P.R. [Cf. *F.A.* 21 No. 2340.]

1181. ROOK, J. A. F., and CAMPLING, R. C. **A note on the use of molassed wood pulp as a substitute for farm roughages in experimental rations for dairy cattle.** *J. agric. Sci.* 53 (3), 1959 (330–2 + 1 plate). 16 refs. O.R.E.

Experiments with an unbleached strong-sulphite wood pulp showed that cows could utilize the material satisfactorily.

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 324, 944, 1053, 1077, 1163.

1182. LIIRI, O., and NYKÄNEN, P. Lastulevykäsikirja. **[Handbook of wood particle boards.]** *Tied. Valt. Tekn. Tutkimusl.* (*Sarja 1—Puu*) No. 5, 1958. pp. 141. 13 refs. [Fi.e.] P.R.

Surveys the manufacture of particle boards in

different countries, defines and classifies types of board, discusses materials, equipment, methods, properties and uses, describes briefly special processes, and lists Finnish wood-particle boards, showing manufacturers, types, properties, etc.

1183. KLAUDITZ, [W.] Bericht über die Sitzung des Arbeitsausschusses 'Entwicklung und Herstellung von Holzspanplatten' im Fachausschuss 'Holzverleimung, Holzwerkstoffe'. **[Report on the session of the Working Committee on 'Development and Manufacture of Particle Boards' in the Technical Committee on 'Wood Gluing and Wood-based Materials'.]** *Ber. Dtsch. Ges. Holzforsch.* No. 2/59, 1959. pp. 19. [G.] P.R.

Brief summaries of reports presented at the session.

1184. KLAUDITZ, W., and MEIER, K. Zur Bestimmung des Harnstoff- und Melaminharzgehaltes von Holzspanplatten. **[Determination of the content of urea and melamine resins in particle boards.]** *Holz Roh- u. Werkstoff* 18 (5), 1960 (163–6). 8 refs. [G.g.e.] P.R.

Compares three methods: (1) Kjeldahl, (2) treatment with a H_2O_2/H_2SO_4 mixture and subsequent titration by the formaldehyde method, and (3) distillation with 30% NaOH solution and subsequent titration. Method (1) takes ca. 5 hours, (2) only 20 min., and (3) takes ca. 2 hours, but can be used only for determining the content of urea resins.

1185. MOTTET, A. L. **Flakeboard vs. chipboard.** *Lumberm.* 87 (7), 1960 (42–3, 61).

Flakeboard costs more to manufacture, but sells for more, and also excels chipboard in bending strength, stiffness, dimensional stability, freedom from 'show-through', and machinability. The main points affecting a decision as to which type of board to use are discussed.

1186. BRUMBAUGH, J. **Directional properties possible in flakeboard.** *Lumberm.* 87 (7), 1960 (46–7).

Tests were made in order to determine the relationship of flake orientation to moduli of rupture and elasticity, internal bond, and dimensional stability of the flakeboard. Results are tabulated and graphed; they show the feasibility of producing flakeboard with directional properties for uses where greater strength or stiffness is needed in one direction than another.

1187. KLAUDITZ, W., and BURO, A. Untersuchungen an Spanplatten aus Spangemischen verschiedener Holzarten. **[Particle boards from chip mixtures of various species.]** *Holz-Zbl.* 86 (85), 1960 (1195–7). 12 refs. [G.g.]

Describes tests indicating that boards of equal density made of Beech or Spruce/Beech mixture differed little from Spruce boards in water absorption, swelling and nail-holding, but that strength decreased with increasing proportion of Beech, though in varying extent for bending strength and longitudinal and transverse tensile strength. The relations of board density, density of the raw material, and bending strength were found to be the same whether the raw material was composed of one species or of a mixture of species. Data for boards made from Beech/Pine, Spruce/Oak, and Spruce/Beech mixtures are presented. By varying the mixture, and thus the density distribution over the cross-section of multilayered boards, it was possible to improve quality over that of boards made from raw material of uniform density.

1188. Eichenschichtholz für die Spanplattenfabrikation. **[Oak cordwood for particle-board manufacture.]** *Holz-Zbl.* 86 (87), 1960 (1225–6). [G.]

Describes a small-scale study of conversion costs, wood content etc. of varying barked and unbarked types of Oak cordwood. Ca. 80% of conversion costs were for barking and, if the wood was allowed to lie some months before being barked, costs were greatly reduced. Bark % was ca. 18% of stacked measure irrespective of diameter. The wood content of a stacked cu.m. of Oak bolts was only 336 kg. vs. 400 kg. for a similar assortment of Beech.

1189. PARRISH, J. R. **Particle board from Wattle wood and Wattle tannin.** *J. S. Afr. For. Ass.* No. 32, 1958 (26–31). 5 refs. [E.e.afrik.]

An adhesive from Wattle extract plus formaldehyde was used in the manufacture of chipboards of *Acacia mollissima* and, for comparison, those from *Pinus patula*. Wattle boards were slightly, though not significantly, less strong than those of Pine. Wattle boards showed stains, apparently caused by leuco-anthocyanidins in the heartwood. Some data on costs are given.

1190. BURROWS, C. H. **Bark board requires neither glue nor sizing.** *Lumberm.* 87 (7), 1960 (76–7).

An account of research at the Oregon Forest Research Center, which shows that: board satisfactory for various uses can be made from [coniferous] bark without resins or size; physical properties can be modified for various uses; board overlaid with sheets of kraft fibre is the most promising and versatile type; panels should be cooled in the press before removal; and bark board can be manufactured economically.

1191. RUFFIN, E. T. **Exterior durability of hardboard.** *For. Prod. J.* 10 (7), 1960 (336–41).

Discusses various factors involved and describes accelerated and natural weathering tests of Masonite hardboards made from Southern hardwoods and/or Southern Pines, or of Douglas Fir, with varying degrees of hydrolysis. These indicated that this factor had the greatest effect on durability and swelling resistance.

1192. EBERHARDT, L. **Latest trends in raw materials and process in the insulation and hardboard fields.** *Tappi* 43 (2), 1960 (191*A*–196*A*). P.R.

Includes a section on the utilization of hardwoods in the U.S. industry, indicating the present trend towards using cheaper, relatively plentiful species such as Oak, Maple and Birch. The problems caused by their darker coloration than less dense hardwoods and softwood, are briefly discussed and

methods of dealing with wood waste in general are examined.

1193. PEEL, J. D. **The properties of experimental fibreboards made from Malayan woods.** *Res. Pamphl. For. Res. Inst., Kepong* No. 24, 1959. pp. 35. 27 refs.

Presents the results of extensive experiments on: (1) The suitability of various test procedures, and (2) the board-making properties of certain timbers. (1) Includes comparisons of methods of determining modulus of rupture (MR) and modulus of elasticity (ME), determination of the number of boards and tests per board required for useful strength test results, orientation experiments with processing conditions, refining, pressing, sizing, problems of residual rubber in boards from *Hevea brasiliensis*, and dimensional stability measurements. From (2) the following conclusions were drawn. Wood from *H. brasiliensis* can give a 78%–90% yield to produce a pale standard hardboard with MR in the range 4300–6400 lb./sq. in. and water absorption < 20%, and produces a super-hardboard with MR in the range 6700–8100 lb./sq. in. if its pulp is prepared by defibration at 100 lb./sq. in. steam pressure. If the wood can be barked cleanly the residual rubber is unlikely to interfere with hardboard manufacture. Several species of *Shorea* and *Tarrietia* can give an 86% and higher yield to make hardboard with MR in the range 2240–8260 lb./sq. in., but mainly 4045–7350 lb./sq. in., equivalent to standard hardboard, with water absorption mainly < 20%, from pulp prepared by defibration at 100 lb./sq. in. Brittle-heart Meranti makes weaker hardboards than those from ordinary wood; it would probably be unacceptable as a raw material. *Cratoxylon arborescens* furnishes pulp in ca. 90% yield by defibration at 100 lb./sq. in. to make boards of strength characteristics similar to those from *Shorea* spp. *Dipterocarpus* spp. and *Dryobalanops aromatica* proved unsuitable. It is possible that *H. brasiliensis* and *Shorea* spp. hardboards are less dimensionally stable than some commercial boards commonly used in Malaya. According to limited experiments, they are both suitable for making insulating board of typical strengths and densities.

1194. PACKMAN, D. F. **The production of hardboard from tropical timbers. V. Mugongo (*Ricinodendron rautanenii*).** *Trop. Sci., Lond.* 2 (1/2), 1960 (64–71). 2 refs.

[Cf. *F.A.* 20 No. 5351.] Standard and super hardboards to the requirements of British Standard 1142 (1953) were made on an experimental scale from Mugongo (*Ricinodendron rautanenii*) by the Defibrator process and by a simpler method involving the use of a disc mill, with no prior steaming or chemical treatment. Boards which, after an oil-tempering treatment, met all the specification requirements were made from unrefined pulp, prepared in high yield by wet-grinding the untreated green chips. Boards made from refined pulp and from pulp prepared by the Defibrator technique, although having higher initial strength, also required oil-tempering in order to meet the specification for water resistance. *From author's summary.*

863. Wood Hydrolysis. Saccharification

1195. ODINCOV, P. N. Vlijanie stroenija kletočnyh stenok drevesiny na processe ee gidroliza. **[Influence of cell-wall structure on wood hydrolysis.]** *Gidrol. lesohim. Prom.* 12 (2), 1959 (3–5). 10 refs. [Russ.russ.] P.R.

From the literature, and the author's own researches, it is shown that the removal of hemicelluloses does not cause the wood to shrink, and that, when the cellulose is removed by treatment with concentrated acids, the lignin occupies the same volume as the original sample of wood. Sugars depress swelling and hinder the dissolving of polysaccharides; this affects the process of hydrolysis taking place in the walls of cells and their cavities. Hydrolysis reaction can be effected with small quantities of concentrated acids at elevated temperatures.

1196. ČALOV, N. V., GORJAČIH, E. F., and LEŠČUK, A. E. Novyj režim gidroliza drevesiny koncentrirovannoj soljanoj kislotoj. **[A new wood-hydrolysis process with concentrated hydrochloric acid.]** *Gidrol. lesohim. Prom.* 12 (3; 4), 1959 (3–5; 1–4). 4 refs. [Russ.] P.R.

A detailed account of laboratory experiments on hydrolysis of wood with concentrated HCl in a battery of diffusers.

866. Utilization of Wood Extractives

See also No. 1200.

1197. SSORIN, V. A., and MIŠIN, P. A. Perspektivy razvitija kanifol'no-ékstrakcionnogo proizvodstva v Vostočnoj Sibiri. **[Prospects for the development of rosin extraction in E. Siberia.]** *Gidrol. lesohim. Prom.* 12 (6), 1959 (19–20). 1 ref. [Russ.] P.R.

Works out the volumes of resinous Scots Pine stumpwood that will be left on clear fellings in the Krasnoyarsk and Irkutsk areas up to 1970, and strongly advocates measures to ensure that this enormous amount of valuable raw material will be utilized.

1198. NIKITIN, N. I., *et al.* Puti ispol'zovanija vodoékstraktivnyh veščestv i drevesiny daurskoj listvennicy. **[Ways of utilizing water-soluble extractives and the wood of *Larix gmelinii*.]** *Trud. Inst. Les.* No. 37, 1958 (108–19). 18 refs. [Russ. russ.] [Cf. *F.A.* 21 No. 2336.]

867. Destructive Distillation

See also Nos. 324, 1219.

1199. SCHMITZ, A., and MISSON, A. La carbonisation du bois dans le Haut-Katanga industriel. **[Wood carbonization in the industrial zone of Haut-Katanga.]** *Publ. Com. Spéc. Katanga (Sér. B)* No. 18, 1960. pp. 71. 6 refs. [F.]

[Cf. *F.A.* 15 No. 3082.] A practical manual covering suitable species, cutting systems, types of kiln, recovery of products, marketing etc.

1200. LJAMIN, V. A. Gazifikacija otrabotannoj kanifol'no-ėkstrakcionnoj ščepy. [**Gasification of chips after rosin extraction.**] *Gidrol. lesohim. Prom.* 12 (7), 1959 (6–8). [Russ.russ.] P.R.

Describes the installation, and the yields of gas and other products obtained.

1201. LANE, P. H. **Wood carbonization in kilns.** *For. Prod. J.* 10 (7), 1960 (344–8). 17 refs.

Summarizes preliminary trial runs with 3 experimental kilns near Three Lakes, Wis., of composite wall construction, lined with (*a*) sheet metal, (*b*) cinder-concrete block, and (*c*) castable refractory, which showed that (*a*) and (*c*) were economical and satisfactory, but not (*b*), which developed cracks. On the basis of these trials, various changes in practices are suggested, including ignition by blow-torch, centre firing with multiple chimneys, air-supply control by power-driven fan, and pre-drying of the raw material. The yield from pre-dried Hard Maple cordwood averaged 30% charcoal, with a fixed carbon % of 79. Carbonization took 11 hours, and cooling 38.

89. Other ('Minor') Forest Products

892. Vegetable Products

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 548–55, 1019, 1026–7, 1046–8, 1189–90.

1202. GOWDA, D. R., and RAMASWAMY, M. N. **The utilisation of *Prosopis juliflora*.** *Indian For.* 86 (7), 1960 (432–4). 4 refs.

Gives the results of analysis of the tannin content of bark and pods, and the constituents of the foliage and wood, from a tree growing at Bangalore. A high N content was noted in the leaves.

1203. ROUX, D. G., and MAIHS, E. A. **Condensed tannins. 3. Isolation and estimation of [*a*] (−)-7 : 3′ : 4′ : 5′-tetrahydroxyflavan-3-ol, [*b*] (+)-catechin and [*c*] (+)-gallocatechin from Black-Wattle-bark extract.** *Biochem. J.* 74 (1), 1960 (44–9). 48 refs. O.R.S.

[Cf. *F.A.* 20 No. 3945.] [*a*] has been isolated from bark extracts of *Acacia decurrens* var. *mollissima* in 0·3% yields, and [*b*] and [*c*] in lower yields, whereas (−)-epicatechin has been shown to be absent from both fresh-bark and commercial extracts. [*a*] appeared to be identical with (−)-robinetinidol and its presence in *A. decurrens* var. *mollissima* further emphasizes the almost exclusive occurrence among the Leguminosae and two genera of the Anacardiaceae of those C_{15} 'flavonoid' compounds of the resorcinol series which have hitherto been isolated.

1204. ROUX, D. G., and EVELYN, S. R. **Condensed tannins. 4. The distribution and deposition of tannins in the heartwoods of *Acacia mollissima* and *Schinopsis* spp.** *Biochem. J.* 76 (1), 1960 (17–23). 28 refs. O.R.S.

The isolation of (+)-catechin and gallic acid from the young heartwood of *Schinopsis* spp. [*S. balansae* and *S. quebracho-colorado*] and the tentative identification of fustin and fisetin in heartwood of *A. decurrens* var. *mollissima* are described. These heartwoods contain enantiomorphous (−)- and (+)-leucofisetinidins respectively, and the vertical and radial distribution of their tannins in relation to average molecular weight, leucoanthocyanidin content and concentration of associated 'non-tannins' are examined and contrasted. *From authors' summary.*

1205. EVELYN, S. R., MAIHS, E. A., and ROUX, D. G. **Condensed tannins. 5. The oxidative condensation of (+)-catechin [from leaves of *Uncaria gambir*].** *Biochem. J.* 76 (1), 1960 (23–7). 23 refs. O.R.S.

1206. HATA, K., and SOGO, M. **[Chemical studies on the bark. VI. Isolation of xanthoperol from the bark of *Cryptomeria japonica* D. Don.]** *J. Jap. Wood Res. Soc.* 5 (4), 1959 (125–7). 3 refs. [Jap.e.*e.*]

[Cf. *F.A.* 20 No. 1005.] Outer bark of *C. japonica* (1 kg. at 15·17% moisture content) was extracted with benzine and, of the 47 g. of sticky extracts obtained, 25 g. were saponified with alcoholic KOH, the resultant solution being acidified with H_2SO_4 and extracted with ether. Separation of the ether solution (method described) indicated the following yields of crystalline compounds: xanthoperol 0·49%, and behenic acid 0·11%, based on the oven-dry weight of the outer bark.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants etc.

See also No. 97.

1207. SEKULIĆ, M. M. O proučavanju lekovitog bilja na južnom delu Velikog Jastrebca. [**The study of medicinal plants in the southern Veliki Jastrebac mountains.**] *Šumarstvo* 12 (11/12), 1959 (612–7). 4 refs. [Serb.serb.g.]

Lists medicinal plants found in the area; those that occur in exploitable quantities, including *Sambucus nigra*, *Crataegus oxyacantha*, and *Corylus avellana*, are discussed in more detail.

1208. DUNHAM, N. W., and ALLARD, K. R. **A preliminary investigation of the roots of *Bixa orellana*.** *J. Amer. Pharm. Ass.* (*sci. Ed.*) 49 (4), 1960 (218–9). 5 refs. O.R.S.

Pharmacologically active principles were found in the water extract.

1209. YOUNGKEN, H. W., SR., JENKINS, H. J., and BUTLER, C. L. **Studies on *Morinda citrifolia* L.** *J. Amer. Pharm. Ass.* (*sci. Ed.*) 49 (5), 1960 (271–3). 3 refs. O.R.S.

[Cf. *F.A.* 20 No. 3961.] Describes the results of a study on the anatomy of the stem and of experiments *in vitro* and *in vivo* on the pharmacological properties of root extracts.

1210. CAHEN, R. Étude pharmacologique de l'aubier de *Tilia sylvestris* L. [**Pharmacological study of the sapwood of *T. cordata*.**] *C.R. Acad. Sci., Paris* 250 (22), 1960 (3743–5). 4 refs. [F.f.] O.R.S.

The effect of a powdery substance obtained from

the aqueous extract of the sapwood by atomization and drying, when injected into dogs and rabbits, seemed to be similar in nature to e.g. that of papaverine.

1211. CAHEN, R., and HIRSCH, C. Étude pharmacodynamique de l'aubier du *Tilia sylvestris* Desf. [**Pharmacodynamic study on the sapwood of *T. cordata*.**] *C.R. Acad. Sci., Paris* 251 (1), 1960 (161–3). 6 refs. [F.f.] O.R.S.

[Cf. preceding abstract.] Injections into dogs had a vasodilatory effect.

1212. ANTONACCIO, L. D. **Aspidofiline, the phenolic alkaloid [from leaves] of *Aspidosperma pyrifolium* Mart.** *J. organ. Chem.* 25 (7), 1960 (1262–3). 4 refs. O.R.S.

1213. GILBERT, B., *et al.* **Alkaloid studies XXIII. Isolation of four new *Aspidosperma* alkaloids: cylindrocarpine, refractine, pyrifoline, and pyrifolidine.** *Experientia, Basle* 16 (2), 1960 (61–2). 7 refs. [E.g.] O.R.S.

From *A. cylindrocarpon* (cylindrocarpine), *A. refractum* (refractine) and *A. pyrifolium* (pyrifoline and pyrifolidine).

1214. JANOT, M.-M., QUI KHUONG-HUU, and GOUTAREL, R. Alcaloïdes stéroïdes. Funtuphyllamines A, B et C, funtumafrines B et C, alcaloïdes du *Funtumia africana* (Benth.) Stapf. [**Steroid alkaloids. Funtuphyllamines A, B and C, and funtumafrines B and C, alkaloids of *F. africana*.**] *C.R. Acad. Sci., Paris* 250 (13), 1960 (2444–7). 7 refs. [F.f.] O.R.S.

1215. NEUSS, N., and CONE, N. J. **Alkaloids of Apocynaceae. V. Hunterine, a new alkaloid from *Hunteria eburnea* Pichon.** *Experientia, Basle* 16 (7), 1960 (302). 7 refs. [E.g.] O.R.S.

1216. CAMP, B. J., and MOORE, J. A. **A quantitative method for the alkaloid of *Acacia berlandieri*.** *J. Amer. Pharm. Ass.* (*sci. Ed.*) 49 (3), 1960 (158–60). 5 refs. O.R.S.

Describes a rapid and reliable method, using the reagent 1-fluoro-2,4-dinitrobenzene, for the quantitative estimation of *N*-methyl beta-phenylethylamine, the principle in the plant poisonous to some animals. The variation of amine content of leaf samples in May–Oct. 1958 is shown.

1217. ITO, K. [**Studies on the alkaloids of Magnoliaceous plants. XXIV. Alkaloids of *Michelia compressa* Maxim. (1).**] *J. Pharm. Soc. Japan* 80 (5), 1960 (705–6). 5 refs. [Jap.e.] O.R.S.

Oxyacanthine, berberine, palmatine, jatrorrhizine and magnoflorine were obtained from the bark. *From author's summary.*

1218. PARIS, R.-R., and QUIRIN, M. Sur le catharticoside, hétéroside flavonique des fruits du nerprun (*Rhamnus cathartica* L.). [**Catharticoside, a flavonic heteroside of the fruits of *R. cathartica*.**] *C.R. Acad. Sci., Paris* 250 (13), 1960 (2448–9). [F.f.] O.R.S.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 89, 556 *et seq.*, 957, 1026.

1219. EDWARDS, E. E. L., and HOWARD, G. E. **Destructively distilled turpentine from Cyprus.** *Trop. Sci., Lond.* 2 (1/2), 1960 (97–8).

A sample prepared from wood of *Pinus halepensis* var. *brutia* was analysed and found to satisfy both the British Standard and the American except for a very slight divergence from the range for non-volatile residue in the former and from sp.gr. in the latter.

1220. DÄSSLER, H.-G., and ZENTSCH, W. Keimungshemmende Wirkung von Bestandteilen der Kiefernterpentinöls. [**Germination-inhibiting components of turpentine oil from Pine.**] *Pharmazie, Berlin* 14 (1), 1959 (46–8). 6 refs. [G.g.] L.S.

Spruce and Pine seed of medium quality was treated with α-pinene, β-pinene, Δ^3 carene, dipentene, or camphene—(*a*) by dipping of the cotyledon end, or (*b*) by exposure to their vapours. (*a*) caused almost complete inhibition of germination except with camphene where the effect, particularly on Spruce seed, was less marked; (*b*) resulted mainly in delayed germination.

1221. DÄSSLER, H.-G., and ZENTSCH, W. Über die Keimungshemmende Wirkung von Bestandteilen des Tannenzapfenöls. [**Germination-inhibiting components of the oil from Silver-Fir cones.**] *Pharmazie, Berlin* 14 (2), 1959 (111–2). 2 refs. [G.] L.S.

[Cf. preceding abstract.] In similar tests with *l*-α-pinene, limonene, bornyl acetate and *l*-borneol, wetting again inhibited, and exposure to vapour delayed, germination. Of the vapour treatments, only limonene had a significant inhibitory effect on both Spruce and Pine.

1222. THOMAS, A. F., and MÜLLER, J. M. **Triterpene acids from [resin of] *Commiphora glandulosa* Schinz.** *Experientia, Basle* 16 (2), 1960 (62–4). 4 refs. [E.g.] O.R.S.

1223. RAO, P. S., BHATIA, K., and SETHI, H. **Processing of crude camphor on a cottage scale.** *Indian For.* 86 (8), 1960 (475–81). 14 refs.

Describes two methods of purifying camphor from *Ocimum kilimandscharicum* on a small scale after distillation: (1) Using a hand-driven centrifuge, with successive alkali and acid washes; this process costs Rs.0·20/kg. crude camphor and gives 97% pure product. (2) By sublimation; an improved unit, which sublimates crude camphor at a cost of Rs.1.25/kg., is described in detail and illustrated.

1224. MUKHERJEE, S., and SHRIVASTAVA, A. N. **The structure of *Acacia sundra* gum. Part II. The structure of the degraded gum.** *Proc. Indian Acad. Sci.* 50*A* (6), 1959 (374–9). 12 refs. O.R.S.

[Cf. *F.A.* 20 No. 1263.]

1225. RIQUE, T. Las gomas galactomananos y la goma de espina corona en la industria papelera. **[Galactomannan gums and gum of *Gleditsia amorphoides* in the papermaking industry.]** *Foll. téc. for. Adm. Nac. Bosques, B. Aires* No. 4, 1960. pp. 17. 15 refs. [Span.span.]

Gum from seed of *G. amorphoides* proved suitable for use in the papermaking industry, having properties similar to those of gum of *Cyamopsis tetragonoloba* and *Ceratonia siliqua*.

1226. PARDO, L. L. Nota preliminar sobre el aprovechamiento del 'neneo' (*Mulinum spinosum* (Cav.) Pers.). **[Preliminary note on the utilization of *M. spinosum*.]** *Notas tecnol. for. Adm. Nac. Bosques, B. Aires* No. 3, 1960. pp. [2]. [Span.]

Brief notes on this shrubby species, which is abundant in the Patagonian region, and on preliminary experiments in collecting gum with a view to its commercial utilization.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

1227. WAGNER, J. Spiraeosid, ein Flavonolglykosid der Rosskastanie. **[Spiraeoside, a flavonol glycoside from [seeds of] Horse Chestnut.]** *Naturwissenschaften* 47 (7), 1960 (158). 5 refs. [G.] O.R.S.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

1228. **Progress report on forestry in Korea.** [*Docum.*] *5th Sess. FAO Asia-Pacif. For. Comm., New Delhi 1960* No. *FAO/APFC*-60/4.6, 1960. pp. 16. Limited distribution.

1229. LAVROVSKIJ, G. N., and KRYLOV, G. V. O promyšlennom osvoenii lesov v Obskom bassejne. **[The industrial utilization of forests in the Ob basin.]** *Lesn. Prom.* 1960 (7), (23–5). [Russ.]

A study of the problem, with particular reference to communications by river and rail. It is recommended that in the next 15–20 years, exploitation should be intensified in the upper and middle parts of the basin, and that capital investment in developing logging in the montane Altai should proceed at a much slower pace.

1230. GLÄSER, H. A. M. **Report to the Government of Iran on the development of forestry, forest utilization and forest industries in Iran, and the demonstration forest and training center, Lowe.** Expanded Technical Assistance Program, FAO, Rome. *FAO* No. 1176, 1959. pp. ii + 90 + 2 maps + 24 photos.

Includes a discussion of supply and demand for wood, touching on village Poplar plantations as an important non-forestry source etc., a description of the forests of the Caspian region and the demonstration forest there, and makes recommendations, with special reference to administration and training at all levels, on the fuelwood and charcoal problem, conservation and sawmilling.

1231. **Thailand national progress report on forestry 1957/59.** [*Docum.*] *5th Sess. FAO Asia-Pacif. For. Comm., New Delhi 1960* No. *FAO/APFC* 60/4.11, 1960. pp. 11 + 1 tbl.

1232. ANGUS, J. R., *et al.* **Report on Board of Inquiry into utilization of natural forest resources [of Fiji].** Government Press, Suva, Fiji. 1960. pp. 13 + map. (*Council Paper* No. 2 of 1960.)

The following recommendations are made *inter alia*: (1) The basic data of a forest inventory should be obtained as soon as is practicable. (2) Annual licences should be reduced to a minimum and long-term licences given where possible. (3) The system of girth limits should be retained, but above such limits full utilization should be permitted, subject to the requirements of soil and water conservation. (4) Enrichment planting should be encouraged outside the permanent forest estate. (5) Extraction by bullocks should be discouraged. (6) All sawmills should be required to register with the Forestry Department. (7) Government should, wherever possible, use local timber. (8) When an export trade develops, the introduction of grading rules should be considered.

902. History of Forests and Forestry

See also No. 1282.

1233. NOŽIČKA, J. Přehled vývoje městských lesů karlovarských. **[Historical survey of the development of the Karlovy Vary [Karlsbad] city forests.]** *Prace Výzkum. Úst. Lesn. ČSR* No. 17, 1959 (259–89). 18 refs. [Cz.russ.g.]

From the 16th century to 1930.

1234. KAUDERS, A. Entwicklung der Forstwissenschaft in der V. R. Kroatien. 100 Jahre Forstunterricht und Forstwissenschaft in Kroatien 1860–1960. **[The development of forest science in Croatia. Forest education and forest science in Croatia 1860–1960.]** *Bulletin Scientifique: Conseil des Académies de la RPF de Yougoslavie, Zagreb* 5 (1), 1959 (1–8). Many refs. [G.]

A brief historical account and review of published work.

1235. Volume jubilaire 1910–1960. **[Jubilee volume 1910–1960.]** *Bull. agric. Congo Belge* Spec. No., 1960. pp. 226. [F.]

Reviews the history of agriculture, forestry, stock raising, hunting and fishing in the Belgian Congo over the years 1885 to 1958, under the following heads: (1) the geographical environment, (2) Central Africa before Stanley, (3) the independent State of the Congo (1885–1908), (4) the Belgian Congo—over the various stages of its history, (5) organizations of a general character, auxiliary to the state organisations, and (6) the future of agriculture in the Belgian Congo.

1236. Bibliographie des œuvres de L. Schaeffer. **[Bibliography of the works of L. Schaeffer.]** *Ann. Éc. Eaux For. Nancy* 17 (1), 1960 (1–12). 143 refs. [F.]

903. Forest Policy, General

1237. GRANDI, C. Aspetti di politica forestale nel Cantone Ticino. **[Aspects of forest policy in the Ticino.]** *Schweiz. Z. Forstw.* 111 (7), 1960 (333–40). [It.f.]

Discusses the need and plans for afforestation and coppice conversion made possible and urgent through the trend to more intensive agriculture with its abandonment of marginal land, with special reference to small private forests and certain communal forests (i.e. Patriziates), participants' rights, etc.

904. General Regional Accounts of Forests and Forestry

See also No. 1.

1238. KAMINSKI, E. Šume i šumarstvo Poljske. **[Forests and forestry in Poland.]** *Šum. List* 83 (8/9), 1959 (300–12). [Croat.]

A statistical survey of forest area and types, forest management, utilization, mechanization, forest products and workers, development prospects, state organization, education of forest officers, research, and the forestry press.

1239. ARNAUDOV, G. Les forêts et l'économie forestière en Bulgarie. **[Forests and forestry in Bulgaria.]** *Bull. For. Soc. Belg.* 67 (6), 1960 (246–53). [F.]

1240. MOONEY, H. F. **Some observations on forestry in Libya.** British Middle East Development Division, Beirut. 1960. pp. 12. Limited distribution.

1241. MOONEY, H. F. **A report on forestry in Eritrea.** British Middle East Development Division, Beirut. 1960. pp. 7. Limited distribution.

1242. GRANDJOT, W. Lebensprobleme auch im Paradies Teneriffa. **[Vital problems even in the paradise of Teneriffe.]** *Holz-Zbl.* 86 (94), 1960 (1319–20). [G.]

Discusses, on the basis of a study tour, the role of forests in the water regime, the dangers of deforestation, litter removal and lopping, and describes reforestation techniques for *Pinus canariensis*, using seedlings grown from 4 to 12 months (according to site) in 15 cm. × 3 cm. bamboo or cane tubes. [Cf. *F.A.* 16 No. 4823.]

1243. ORTUÑO MEDINA, F. Aprovechamientos forestales en los montes de Canarias. **[Forest resources of the Canary Islands.]** *Montes, Madrid* 16 (93), 1960 (271–5). [Span.]

Presents short notes on the forests of the islands and their management and financial yield.

1244. **[Forestry in] Tristan da Cunha.** *For. Adv. Newslett. Colon. Off., Lond.* No. 8, 1960: *Appendix A* (2–3). Restricted. I.F.B.

The natural vegetation of the lower slopes is a thicket of *Phylica arborea* (a contorted semi-prostrate tree reaching 15 ft.) and tree-fern (*Blechnum palmiforme*). *P. arborea*, the sole source of firewood, has been heavily overcut. Constructional timber is completely lacking. Planting trials were begun in 1954 with trees including *Eucalyptus viminalis*, *E. ficifolia*, *Acacia decurrens* var. *mollissima*, *Pinus pinaster*, *P. radiata*, *P. halepensis*, *Pittosporum crassifolium*, *P. undulatum*, *Salix* and *Populus* spp., and *Cupressus macrocarpa*. It appears that *P. pinaster* and *P. radiata* are most resistant to the salt-laden wind, and these, with *E. viminalis* in sheltered places, form the bulk of current planting (1500 trees planted in 1959). The first 50 Eucalypts are ready for cutting.

1245. NOBLES, R. W. **Forestry in the U.S. Virgin Islands.** *J. For.* 58 (7), 1960 (524–7).

1246. **[Forestry in] Tonga.** *For. Adv. Newslett. Colon. Off., Lond.* No. 8, 1960: *Appendix A* (1). Restricted. I.F.B.

The Crown owns most of Tonga's 27,000 acres of forest, the bulk of which is on the island of 'Eua. The most important timber trees are *Rhus taitensis*, *Alphitonia zizyphoides*, *Elaeocarpus tonganus*, *Calophyllum vitiensis*, *Pleiogynium solandri*; other large trees include *Elattostachys falcata*, *Hernandia ovigera*, *Terminalia catappa*, and *Dysoxylum* sp. (probably *D. richii*). Forestry services are being developed and a Forestry Ordinance has recently been drafted, which will provide for forest reserves, town and village forest areas, control of felling along the sea-shore, stream banks, etc. On 'Eua there are a government sawmill and 7 small private mills, the latter producing banana-case material principally from *R. taitensis*, *A. zizyphoides*, *Myristica hypargyrea*, *Aleurites moluccana*, and *Macaranga harveyana*. Most of the constructional timber is, however, imported, and these imports are expanding rapidly. Small-scale planting has been undertaken on land-reclamation schemes in freshwater swamps, including *Calophyllum inophyllum*. In other areas *Albizzia moluccana* and *Cedrela odorata* are doing well; among recent experimental introductions are various Eucalypts, *Salix viminalis* (cuttings from U.K.), *Tamarix aphylla* (from Queensland, for windbreaks), Teak, *Casuarina*, and *Grevillea*.

1247. **[Forestry in] Pitcairn.** *For. Adv. Newslett. Colon. Off., Lond.* No. 8, 1960: *Appendix A* (3). Restricted. I.F.B.

The original forest cover, probably including *Hibiscus tiliaceus* and *Metrosideros villosa*, has been reduced by clearing and burning to a small relict patch. Much of the land is now covered with secondary bush, including *Thespesia populnea*, *Broussonetia papyrifera*, *Eugenia jambos*, *Psidium guajava*, and *Lantana camara*. Erosion is a serious problem on cultivated lands,and has been accelerated by heavy goat-grazing. Recommendations have recently been made for a small afforestation programme and the elimination of goats, partly to stop erosion on the steep hill-sides and partly to make the island self-supporting in timber. At present all timber is imported. Species suggested for planting include *H. tiliaceus* and *M. villosa*, *Glochidion tahitense* var. *pitcairnense*, *Aleurites moluccana*, *Sapindus saponaria*, *Calophyllum inophyllum*, *Pisonia grandis*, and *T. populnea*.

1248. **Utilization of timber resources on watersheds: Evidence presented to the State Development**

Committee on its enquiry into the utilization of timber resources in the watersheds of the State [of Victoria]. *Bull. For. Comm. Vict.* No. 11, 1959. pp. 83 + 3 maps.

Contains the following chapters: Forest management (*K. V. M. Ferguson*); Forest resources (*F. R. Moulds*); Forest utilization (*A. W. Shillinglaw*); Fire protection (*R. T. Seaton*); Water pollution (*C. J. Irvine*); Forests in the State's economy (*A. L. Benallack*); Forestry in south-west Victoria (*F. S. Incoll*); Forestry in Central Victoria (*A.H. Beetham*); Forests and water supply (*A. O. Lawrence*). There is an appendix of common and botanical names.

905. Forest Statistics and Resources

See also Nos. 324, 914, 1058.

1249. **World Forest Inventory 1958.** FAO, Rome. 1960. pp. 137 + 3 maps, 4 dgms. [E.F. Span.] Price $2.50 (12*s.* 6*d.*).

Covers the period 1954–58 inclusive, and follows the lines of the previous inventories [see *F.A.* 16 No. 4829].

1250. Weck, J. Die Bedeutung der Waldformationsklassen der Tropen für die Holzversorgung der Welt. **[The importance of the tropical forest types in world wood production.]** *Holz Roh- u. Werkstoff* 18 (8), 1960 (273–81). 66 refs. [G.g.e.] P.R.

Though about half of the potentially productive forest area of the world lies in the tropics, these forests at present produce $< \frac{1}{4}$ of the world's wood and only ca. 6% of its timber. The potential of tropical forests for wood production is still being overestimated, but despite this, their present wood production represents only a small fraction of their real potential. While, in the near future, a considerable increase is to be expected, most of this will be absorbed in the developing tropical countries themselves; hence the proportion of tropical timbers used by industrial non-tropical countries is unlikely as yet to increase sharply.

1251. [Kleppen, M.] Lauvtreressursene i våre viktigste barskogområder. **[Hardwood supplies in the main Norwegian softwood districts.]** *Norsk Skogbr.* 6 (11/12), 1960 (421). [Nor.]

Presents tabulated data for Southern and East Norway, Trøndelag and Helgeland.

1252. Bykov, S. P. Lesa zelenoj zony Moskvy. **[Forests in the Moscow green belt.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 34, 1958 (157–65). [Russ.]

Tabulates data on: the forest area (showing %s of natural forest, plantations, burns, fellings, etc.), age classes, principal species, site types, site classes, and stand densities. Aims of management in the green belt are outlined.

1253. **Canadian forestry statistics. 1959.** Dominion Bureau of Statistics, Ottawa 1960. pp. 24.

This report, the first of a new annual series, contains all the information formerly included in the annual 'Amendments to forest and forest products statistics—Canada'.

1254. Larson, R. W. **South Carolina's timber.** *For. Surv. Release Stheast. For. Exp. Sta.* No. 55, 1960. pp. 38 + 39 tbls.

Total timber volume and demand are increasing, but size and quality, particularly of softwoods, decreased.

1255. Grantham, J. B. **Availability and use of wood for pulp in the Pacific Northwest.** *Tappi* 43 (7), 1960 (218*A*–221*A*). 1 ref. P.R.

Includes tabulated data on the supply and consumption of sawtimber and pulp by species, etc.

1256. Casamajor, P., Teeguarden, D., and Zivnuska, J. **Timber marketing and land ownership in Mendocino County.** *Bull. Calif. Agric. Exp. Sta.* No. 772, 1960. pp. 56. 16 refs.

A study in a Californian county containing 1,305,000 acres of commercial forest (58% of the total land area), of which 81% is privately owned, with 57% of the holdings < 5000 acres).

907. Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc.)

See also section 166 and Nos. 280, 320, 1248, 1252.

1257. Sonderheft Naturparke. **[Special number: nature parks.]** *Forst- u. Holzw.* 15 (15), 1960 (285–313). [G.]

Contains 13 short articles on nature parks in Germany, discussing, *inter alia*, their relation to forestry, and also the creation of 'nature paths' for the public with notices or guide books pointing out things of interest in the forest.

1258. Džepina, B. Prašumski reservati u Bosni i Hercegovini. **[Virgin forest reserves in Bosnia and Herzegovina.]** *Šum. List* 84 (5/6), 1960 (179–86). [Croat.]

Some 34,000 ha. of virgin forest remain in Bosnia and Herzegovina. The preservation, location, extent, and scientific value of these areas are discussed.

908. Relationship to Other Branches of Husbandry and Industry

See also Nos. 1270–7.

1259. Michael, D. T. **Aspects of shelter in relation to the grazing animal.** *Scot. For.* 14 (3), 1960 (130–5).

Considers, *inter alia*, the effect of shelter provided by trees and forest on the health of sheep and cattle. Such shelter is thought to be of considerable advantage, but the point is made that over a long period shelter without food is of little use.

91. Land Use, Land-Use Policy (including Afforestation Policy)

See also Nos. 1235, 1237, 1289.

1260. Kallio, K. Maankäyttölain nojalla perustettavan viljelystilan metsäpinta-alan määrittämisestä. **[Determining the forest area of an agricultural holding to be established under the Land Use Act.]** *Metsät. Aikak.* 1960 (5; 6/7), (184–9, 241). 8 refs. [Fi.e.]

The Act of 1958 requires that, in allocating forest land, allowance must be made for differences

in soil productivity, mean increment, volume and structure of the growing stock and the assurance of a regular yield of wood. Coefficients derived for use in these calculations are presented. *From author's summary.*

1261. L'utilisation des terres dans la région méditerranéenne du point de vue forestier, et ses tendances: France. **[Land use in the Mediterranean region from a forestry point of view, and its trends: France.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM*/60/5-*G*, 1960. pp. 23 + 3 tbls. [F.] Limited distribution.

1262. L'utilisation des terres dans la région méditerranéenne d'un point de vue forestier, et ses tendances: Italie. **[Land use in the Mediterranean region from a forestry point of view, and its trends: Italy.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM*/60/5-*B*, 1960. pp. 11. [F.] Limited distribution.

1263. LAURE, G. Produttività montana e arido-selvicoltura mediterranea della Sicilia. **[The mountain economy and forestry of the arid Mediterranean type in Sicily.]** *Monti e Boschi* 11 (6), 1960 (253–61). 11 refs. [It.f.e.]

Sketches the history of land use and soil degradation through deforestation and over-grazing, and stresses the need for silvicultural methods suited to arid conditions, rather than classic forms of forestry. Mulching and fertilizing are necessary as well as irrigation, in the establishment of forest plantations.

1264. NAVARRO GARNICA, M. La utilización de tierras en la región mediterránea desde el punto de vista forestal y sus tendencias: España. **[Land-use in the Mediterranean region from the forestry point of view and its trends: Spain.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM*/60/5-*B*, 1960. pp. 8. [Span.] Limited distribution.

1265. SAMPAIO, J. SALAZAR. L'utilisation des terres de la région méditerranéene du point de vue forestier et ses tendances: Portugal. **[Land use in the Mediterranean region from the forestry point of view and its trends: Portugal.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960 No. FAO/SCM*/60/5-*C*, 1960. pp. 9. [F.] Limited distribution.

1266. MENDONÇA, J. DA COSTA. Portugal: l'action exercée par l'état portuguais dans le reboisement des terrains publics du littoral et des montagnes. **[Portugal: action of the state in afforestation of publicly owned lands on the coast and in the mountains.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM*/60-5*D*, 1960. pp. 8. [F.] Limited distribution.

1267. **The land-use situation in the Mediterranean region from the forestry point of view and its trends: Yugoslavia.** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM*/60/5-*A*, 1960. pp. 16 + map. [E.] Limited distribution.

1268. L'utilisation des terres dans la région méditerranéenne du point de vue forestier et ses tendances: Grèce. **[Land use in the Mediterranean region from a forestry point of view, and its trends: Greece.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM*/60/5-*I*, 1960. pp. 12. [F.] Limited distribution.

1269. L'utilisation des terres dans la région méditerranéene du point de vue forestier et ses tendances: République Arabe Unie (Région Syrienne). **[Land use in the Mediterranean region from a forestry point of view, and its trends: United Arab Republic (Syrian region).]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM*/60/5-*F*, 1960. pp. 7. [F.] Limited distribution.

1270. Les rapports entre la forêt et l'aménagement des parcours du point de vue technique et adminstratif: Italie. **[The relations between forest and pasture management from a technical and administrative point of view: Italy.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM*/60/6-*E*, 1960. pp. 12. [F.] Limited distribution.

1271. Las relaciones entre el bosque y la ordenación de pastos desde el punto de vista técnico y administrativo: España. **[The relations between forest and pasture management from a technical and administrative point of view: Spain.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM*/60/6-*B*, 1960. pp. 40. [Span.] Limited distribution.

1272. **The interrelations between forest and range management from a technical and administrative point of view: Yugoslavia.** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM*/60/6-*A*, 1960. pp. 10. [E.] Limited distribution.

1273. KAUDERS, A. Le reboisement du karst dans la République Populaire de Croatie. **[The afforestation of the karst in Croatia.]** *Bulletin Scientifique: Conseil des Académies de la RPF de Yougoslavie* 5 (2), 1960 (33–7). 11 refs. [F.]

A historical account of the deforestation of, and attempts to afforest, the karst region. The need for reconciling forest policy with the dependence of the peasant population on pastoral husbandry is emphasised.

1274. Les rapports entre la forêt et l'aménagement des parcours du point de vue technique et administratif: République Arabe Unie (Région Syrienne). **[The relations between forest and pasture management from the technical and administrative point of view: United Arab Republic (Syrian Region).]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/1960/6-F*, 1960. pp. 2. [F.] Limited distribution.

1275. **The interrelations between forest and range management from a technical and administrative point of view: Israel.** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/60/6-D*, 1960. pp. 3. [E.] Limited distribution.

1276. Les rapports entre la forêt et l'aménagement des parcours du point de vue technique et administratif: Tunisie. **[The relations between forest and pasture management from the technical and administrative point of view: Tunisia.]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/60/6-H*, 1960. pp. 8. [F.] Limited distribution.

1277. Les rapports entre la forêt et l'aménagement des parcours du point de vue technique et administratif: France (Algérie). **[The relations between forest and pasture management from the technical and administrative point of view: France (Algeria).]** [*Docum.*] *7th Sess. FAO Jt. Subcomm. Medit. For. Probl., Lisbon 1960* No. *FAO/SCM/60/6-G*. 1960. pp. 10. [F.] Limited distribution.

1278. PEKER, H. Seyhan ve Ceyhan havzalarında orman tahripleri, sebepleri, neticeleri ve bunlara karşi alınacak tedbirler hakkında araştırmalar. **[Causes and effects of forest destruction in the Seyhan and Ceyhan basins [Anatolia] and necessary remedial measures.]** *Zir. Vek. Orm. umum Müd. Yay.* No. 16, 1958. pp. 233 + 8 tbls., 2 gphs., 8 maps. 346 refs. [Turk.g.]

A greatly expanded version of work already noticed [see *F.A.* 20 No. 4010].

1279. HONJYO, T. **[Researches of the forest management in mountainous villages from some point of view. Yakuno-Cho, Amata-Gun, Kyoto Prefecture.]** *Sci. Rep. Kyoto Prefect. Univ.* (*Agric.*) No. 11, 1959 (141–7). 13 refs. [Jap.e.]

Basing his views on a survey of 11 public and private forest holdings, the author makes suggestions for better management and land utilization in a scheme to assist farmers in this district, where the area of agricultural land is limited and already fully utilized.

1280. AHN, P. M. **The principal areas of remaining original forest in Western Ghana, and their agricultural potential.** Ghana Division of Agriculture, Kumasi. 1959. pp. 10 + 4 maps. 8 refs.

1281. GUILLARD, J. P. **Report to the Government of Brazil on the Mamanguape river basin pilot project.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1179, 1960. pp. [ii] + 51 + 11 photos, 1 sketchmap. Limited distribution.

Includes a brief description of the basin, covering 320,000 ha. in N.E. Brazil, with wide variation in climate, soils, vegetation, etc., and of the adjoining semi-arid Cariris Velhos region. Makes recommendations on rural development and land use (need to conserve existing forests and to reforest large tracts of former rain forest; suggestions on research into the suitability of conifer species etc.).

92. Forest Ownership and Ownership Policy

See also No. 1256.

1282. JACONO, S. L. **Establishment and modification of national forest boundaries [in the U.S.A.]. A chronologic record 1891–1959.** Division of Engineering, U.S. Forest Service, Washington D.C. 1959. pp. 92 + vii + 1 map.

Presents chronological references listing comprehensively the authentic government actions affecting Federal forest reserves and national forests, and citing the supporting documents required to trace the legal history of each to June 30, 1959 (beginning with the Creative Act of 3/3/91).

1283. **Jackson State Forest status report 1957–1959.** California Division of Forestry, Sacramento, Calif. 1960. pp. 27.

Describes this tract of ca. 52,000 acres of Redwood/Douglas Fir forest, and its management since acquisition by the State in 1947. Experimental and demonstration projects, recognized as the primary purpose of State ownership, are being carried out on both harvesting of old growth and management of young growth.

1284. **[Village] forestry lots.** *Extr.* from *Rep. Dir. Agric. Fish. For. Hong Kong 1958/59*, 1959 (61–2). P.R.

Outlines progress of the government's assistance plan in the planting of village forestry lots designed to provide initially for a quick return of wood for fuel, and poles and timber for house and farm construction, and also for the more general aim of soil protection and water conservation for agriculture.

93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

See also No. 1282.

1285. SIMEUNOVIĆ, D. S. Osnove pravnog regulisanja odnosa u šumarstvu. **[Principles of juridical regulation of [social, political and economic] relations in [Jugoslavian] forestry.]** *Šum. List* 83 (12), 1959 (412–25). 28 refs. [Croat.f.]

A review of Jugoslavian forest law (particularly the laws of 1929 and 1947, the second of which differed little from its predecessor), emphasizing the difference between socialist and bourgeois forest legislation. Fundamental changes in the forest economy must be recognized in future legislation: e.g. the state now possesses 5,906,999 ha. of forest, vs. 2,852,466 before the war; administration has been decentralized so that each Federal Republic controls its own forests; and representatives of the local people play an important part in the management of forest districts.

1286. GILES, J. W. **Timber rights of life tenants.** *Amer. Forests* 66 (7), 1960 (21, 88–9).

A discussion of the present state of American law.

1287. **The East Pakistan vested forests' costs and profits rules. 1959, No. 1603.** *Food agric. Leg.* 8 (4), 1960. pp. 4.

1288. VOLPINI, C. L'usufrutto dei boschi. **[The usufruct of woodlands.]** *Monti e Boschi* 11 (6), 1960 (243–7). [It.f.e.]

Examines the juridical precedents for the institution of forest usufruct and the principles established in the current Italian civil code with reference to the allotment of natural crops between proprietor and usufructuary. The author makes some technical suggestions for the allotment of crops in the case of slow-growing even-aged forests.

1289. PANEGROSSI, T. La ripartizzione delle terre a bosco e a pascolo tra il comune di Cortina e le regole ampezzane nel quadro della legislazione vigente. **[The apportioning of woodland and pasture between the commune of Cortina and the families with rights of usage, in the framework of the present law.]** *Ital. for. mont.* 15 (3), 1960 (93–109). [It.it.f.]

An account of the long-drawn-out litigation and the decisions of the special commission finally appointed to settle the question (90% was allotted to the families and 10% to the commune). The bearing of this on the general relation of private and communal rights in mountain areas is discussed.

94. Other Methods to Implement Forest Policy

See also No. 1284.

941. State Subsidies etc.

1290. WEBSTER, H. H. **An economic analysis of certain stumpage production alternatives in Pennsylvania.** *Abstr. of thesis*, in *Dissert. Abstr.* 20 (12), 1960 (4479–80). O.R.S.

The Department of Forests and Waters is appropriating funds for many forest practices aimed primarily at increasing the volume and value of timber grown in the state. The purpose of this study was to determine where, and for what forest practices, additional funds should be spent in producing stumpage. Measures considered were (1) planting of White Pine and Norway Spruce, (2) cleaning and cull-tree removal in hardwood seedling-and-sapling stands, and (3) thinning in hardwood pole-timber stands. An economic analysis showed that a total of $78.6 million should be spent for special production measures on commercial forest lands over a 5-year period, on site classes I and II, but that expenditure is justifiable only on some basis other than timber produced on class III and scrub-Oak land; the optimum allocation would be $13.2 million for (2) and $34.4 million for (3). At relatively low levels of increased expenditure, (3) should be strongly emphasized since its costs on an output basis are lower than those of (1) and (2). General conclusions are that there is a tremendous range in the costs of producing additional stumpage, and that stumpage production alternatives must be appraised in relation to each other and in terms of cost on an output basis.

944. Co-operation. Collaboration of Forest Owners

See No. 917.

945.1. Advisory and Information Services, Documentation Centres

1291. BOALCH, D. H. [Editor.] **World directory of agricultural libraries and documentation centres.** International Association of Agricultural Librarians and Documentalists, Harpenden. 1960. pp. 280.

945.2. Publicity, Propaganda (including Demonstration Forests)

See also No. 1283.

1292. UZUNER, A. R. Meryemana Lâdin Araştırma Ormanı. **[The Meryema Spruce Research Forest.]** *Orm. Araşt. Enst. Derg.* 5 (2), 1959 (45–50). 5 refs. [Turk.]

Describes this forest near Trebizond, recently designated for research purposes. Main subjects of research will be an efficient system of silviculture for *Picea orientalis* forests, the best management plans, proper control of pests and diseases, etc.

1293. THIRGOOD, J. V. **The functions of the experimental forest.** *Emp. For. J.* 39 (3), 1960 (319–23). 15 refs.

The place of experimental forests in North American forestry is considered, and their special values and limitations discussed. Aims and objects are considered in regard to research, education, and demonstration. Specific examples are cited and varying opinions presented. Brief mention is made of their use elsewhere. *Author's summary.*

1294. GOODLETT, J. C. **The development of site concepts at the Harvard Forest and their impact upon management policy.** *Bull. Harv. For.* No. 28, 1960. pp. 128. 76 refs.

Reviews the experience gained in this large-scale attempt at sustained-yield management under American conditions over a period of 50 years, from the early unsuccessful attempts to regenerate the then existing White Pine stands to the present policy of growing chiefly hardwoods; traces the increasing role played by site evaluation both for initial establishment and the later growth potential of species and forest types; and discusses the chief studies of past land use, microclimate, soils etc., carried out in order to elucidate these interrelationships.

945.3. Education. Training. (Including Educational Tours and Information on Careers)

See also Nos. 1234, 1299.

1295. WECK, J. Forstliche Universitätsausbildung. **[University training in forestry.]** *Allg. Forstzeitschr.* 15 (29), 1960 (414–6). [G.]

A German version of a paper submitted to the 5th World Forestry Congress, discussing, in accordance with the terms of reference laid down by the Congress, the requirements of a course designed for countries about to introduce University education for foresters whose tasks will include wide administrative and land-use problems.

1296. HEMMI, L., and PAATERO, E. **Finnish forest school for farmers.** *Amer. Forests* 66 (8), 1960 (24–5, 60–5).

Describes the working and scope of the School of

Forestry for Farmers run by the Forest Board of North Savo at Toivala. Besides short courses and visits, two main courses are held each year. The combination of theoretical and practical training in forest management and logging (with some emphasis on the comprehension and use of information in textbooks) is designed to enable farmers to carry out different types of work independently. [Cf. *F.A.* 21 No. 1286.]

1297. Schippel, H. R. Rapport från skoglig studieresa i Norge den 10–15 november 1959. **[Report on a forestry study tour in Norway, 10–15 Nov. 1959.]** *VSA-Redog. Fören. Värmlands Skogsarbetsstud.* No. 27, 1960. pp. iv + 22 + [6]. [Sw.sw.]

Deals mainly with Norwegian examples of transport by winch and by overhead cable.

945.4. Research

See also Nos. 68, 135–6, 947, 1234.

1298. Dix ans de recherches forestières tropicales. **[Ten years of tropical forestry research.]** *Publ. Centre Tech. For. Trop.* No. 18, 1960. pp. 55. 164 refs. [F.]

A summary of work carried out at the Centre Technique Forestier Tropical at Nogent-sur-Marne.

1299. Köstler, J. N., Kollmann, F., and Massow, V. von. Denkschrift zur Lage der Forstwissenschaft und Holzforschung. **[Report on the state of forest science and wood research [in Germany].]** Franz Steiner Verlag GmbH, Wiesbaden. 1960. pp. vii + 99 + 4 tbls. [G.]

Covers the history of research on forestry and wood; research and teaching in the Universities and State and other institutions, with outlines of courses, fields of research, etc., and publications and documentation.

1300. Sobotka, A., and Daňha, J. Vývoj, organisace a úkoly Výzkumného ústava lesního hospodářství a myslivosti ČSAZV ve Zbraslavi-Strnadech. **[Development, organization and research programme of the Forestry and Game Research Institute, Zbraslav-Strnady.]** *Prace Výzkum. Úst. Lesn. ČSR* No. 17, 1959 (7–24). 3 refs. [Cz.Russ. G.E.]

1301. **Research programme [for Malaya] 1958–62: progress report for 1959.** *Res. Pamphl. For. Res. Inst., Kepong* No. 26*A*, 1960. pp. 76. [Cf. *F.A.* 21 No. 2610.]

1302. **Forest Research Conference, January 1960.** Federal Department of Forest Research, Ibadan Nigeria. 1960. pp. 44. Price 9*d.*

Includes the following papers, with discussions: Silvicultural research (*P. C. Lancaster*); Fire control in savanna forest reserves (*C. A. M. Nash*); Report on the C.S.A. meeting of specialists in open forests and woodland in tropical Africa, Ndola, 1959 (*R. H. Kemp*); Observations on seasonal changes in the Olokemeji Forest Reserve (*B. Hopkins*); The periodicity of tree growth and development in Nigeria (*E. Njoku*); Is the Oban forest a primary forest (*C. F. A. Onochie*); Work of the physiology section (*J. A. Mackenzie*); Research on forest soils (*R. N. Jenkin*); Third Inter-African Soils Conference, Nov. 1959 (*R. N. Jenkin*); Statistical methods in Nigerian forestry (*J. F. Redhead*); Stratified random sampling: results obtained with small-scale designs in Southern Cameroons investigations (*J. R. Charter*). Other papers are being published separately as *Information Bulletins.*

1303. Duplaquet, L. Le Centre Tropical de Recherches Forestières de Río Piedras, à Porto-Rico. **[The Tropical Forest Experiment Station, Río Piedras, Puerto Rico.]** *Rev. for. franç.* 12 (7), 1960 (445–7). [F.]

An account of the forests, research done and in progress, and the future programme, based on a visit by the author.

946.2. Conferences and Excursions

See Nos. 136, 944, 1302.

95. Forest Taxation

See No. 324.

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries

See No. 617.

97. International Forest Policy and Other International Collaboration

971. Congresses, Conferences; Excursions

See also Nos. 319, 769.

1304. Deuxième session de la Conférence Interafricaine Forestière, Pointe Noire 3–11 Juillet 1958. **[Second session of the Inter-African Forestry Conference at Pointe Noire, 3–11 July 1958.]** *Bois For. Trop.* No. 62, 1958 (30–6). [F.e.span.]

A résumé of the proceedings. The agenda included the drawing up of a balance-sheet of forest policy, the study of natural stands, and artificial regeneration. Papers were read on the ecology, silviculture etc. of *miombo* (*Brachystegia/Isoberlinia* forest), and on the effect and control of bush fires.

FORESTRY THE WORLD OVER

References: 1. *American Forests*, Washington; 2. *American Nurseryman*, Chicago; 3. *CDF Bulletin*, Bucharest; 4. *Daily Telegraph*, London; 5. *FAO News Letter*, Bangkok; 6. *FAO Press Release*, Rome; 7. *Forest Log*, Salem, Ore.; 8. *Holzzucht*, Reinbek; 9. *India News*, London; 10. *Journal of Forestry*, Washington; 11. *Nature*, London; 12. *New Commonwealth*, London; 13. *Report of the New Zealand Forest Service*, Wellington; 14. *Revue Forestière Française*, Paris; 15. *Revue Internationale du Bois*, Paris; 16. *Southern Lumberman*, Nashville, Tennessee; 17. *Timber of Canada*, Toronto; 18. *Timber and Plywood*, London; 19. *Timber Trades Journal*, London; 20. *Tree-Ring Bulletin*, Tucson, Arizona; 21. *Unesco Bulletin*, Paris; 22. *Wood Preserving News*, Chicago; 23. *Woodworking Industry*, London.

International. A general symposium on arid-zone problems was held in Paris, 11–18 May 1960, to review the achievements of UNESCO's arid-zone programme since it was launched 9 years ago. Under its terms of reference, the UNESCO 'Major Project', which has been directed mainly to countries in N. Africa, the Middle East, and S.E. Asia, is due to end in 1962, but there was general agreement at the meeting that the work must go on, and indeed be extended. Among suggestions for further activities is that of a pilot project to apply the results of research to the reclamation of one particular desert. Another was the joint exploration, through the co-operation of all North African countries, of the underground water formations of this classical desert region. The arid-zone programme is probably unique in the range of sciences that it embraces—geology, geophysics, climatology, micro-climatology, physiology (plant, animal, and human), soil physics, soil chemistry, hydrology, geography in all its aspects, solar engineering, desalinization of water, animal husbandry etc. At the Paris meeting there was a also a demand that the social sciences and education should be added (**21**; Sept. 1960).

A meeting of the FAO working party on wood hydrolysis was held at Tokyo, 10–15 Oct. 1960, immediately before the FAO/ECAFE Far Eastern Conference on Pulp and Paper. Papers to be presented at the meeting included several on the present state of development of the wood hydrolysis industry throughout the world, current research in wood hydrolysis, supply of raw materials, and various aspects of recent process development (**6**; 8.9.60).

An international colloquium on vegetation mapping was held at Toulouse in May 1960. The cartographers of 10 countries took part, and the papers are shortly to be published by Centre National de la Recherche Scientifique, Paris (**14**; Nov. 1960).

An International Conference on Forest Tree Growth was held at the University of Arizona on 10–14 April 1960. Sessions were held on physiology, soils, climate, dendrochronology, and mensuration. Papers are being prepared for publication (**20**; July 1960).

Forestry will be one of the 9 broad fields of science to be covered at the Tenth Pacific Science Congress to be held at Honolulu, 21 Aug.–6 Sept. 1961. A series of symposia will be organized in 3 divisions —forest biology, forest management, and forest products (**6**; 7.11.60).

An International Symposium on Termites in the Humid Tropics, organized jointly by the Zoological Survey of India and UNESCO was held at New Delhi in Oct. 1960. Delegates from Ceylon, India, and Indonesia were expected (**21**; Sept. 1960).

FAO conferences

	1960	
10–15 Oct.	Tokyo	Working Party on Wood Hydrolysis
29 or 31 Oct.	Tokyo	First Meeting of FAO Pulp & Paper Advisory Board
31 Oct.–7 Nov.	Ibadan	1st Session African Forestry Commission
	1961	
8–17 March	Geneva	Special FAO/ECE Meeting on the Utilization of Small-Sized Wood
11–13 April	Turkey	2nd Poplar Conference for the Near East
August	Brazil	2nd World *Eucalyptus* Conference
11–15 Sept.	Geneva	FAO/ECE *ad hoc* Working Party on Production, Demand, and Supply of Fibreboards and Particle Boards
Sept.	Sweden	International Course on Vocational Forestry Education (FAO/ECE/ILO).

Canada. A new, light, easily manoeuvred log-pond boom boat, the 'Logbronc', was recently demonstrated at Vancouver, B.C. It is 13 ft. long, with 5-ft. beam, and of steel construction. It is

powered with a 45-h.p. Mercury outboard engine, which rotates amidships a full 360°. The boat can be operated by one man, which will cut normal boom crews by three (**17**; Nov. 1960).

France. A fully automated 'ecotron' from which, at a flick of a switch, it will be possible to obtain precise data on how plants adapt themselves and survive during a torrid summer in the Sahara or a rainy spell in Provence, is to be built at the Institute of Botany, Montpellier University. In it, a climate will not only be reproduced, but will be 'taken apart' so that the ecologist will be able to learn which climatic factors (light, temperature, humidity etc.) are essential to the life of a plant. In outward appearance it will be a long, low building of zigzag design standing in the shade of the ancient trees of the botanical gardens. The heart of the ecotron will be its control room, where a single man, with panels of switches and rheostats, will be able to set the weather in its laboratory rooms by an automated 'electronic brain'. For example, it will be possible to make graphs of temperature, humidity, and sunlight in, say, central Tunisia, and feed them into this 'brain', which will reproduce the same conditions within a given room of the ecotron. Next to each room will be a small laboratory where readings can be taken without any need of entering the room. The ecotron differs from the 'phytotrons' already in use in the U.S.A., France, the Netherlands, and the U.S.S.R., in which the growth of plants over a long period is studied in large rooms held at a constant temperature, and in which, to observe reactions to a change of temperature, it is necessary to move the plant to a different room. The ecotron will also include a cold room where temperatures as low as 5° F. (15° C. below zero) can be created, and 4 greenhouses where plants will 'perform' under natural light while other conditions are varied. Temperatures in these rooms will be controlled: in the hottest they will be 'Saharan'. In another room, plants will be subjected to small doses of radioactivity (**21**; Sept. 1960).

Germany. Voles in a Poplar plantation were successfully controlled by CO with the help of a tube fixed to the exhaust of the petrol engine of a portable sprayer (**8**; Sept. 1960).

Great Britain. One of the places visited in the summer tour of the Royal Forestry Society of England and Wales was the grounds of Tortworth Court, Gloucestershire, now an open prison. The arboretum there was the work of the third Earl, who began planting when he inherited the property in 1853, and was able to see some results of his efforts by the time he died in 1921 at the age of 94. Some of the oldest specimens of American Oak in Britain are at Tortworth, as well as other rare shrubs and trees. Part of the labour for keeping up the arboretum is now supplied by the prisoners (**4**; 22.8.60).

The problem of corrosion by chromic acid, lime, and chemical dye solutions in tanning drums has been solved at R. & A. Kohnstamm Ltd., Beckenham, by the use of Permaply, a specially treated, waterproof plywood for the access doors of the large drums. The doors are framed in gunmetal and secured by stainless steel bolts (**18**; 21.7.60).

In building the prototype Britten-Norman Cushioncraft at Bembridge, I.o.W., timber and plywood have played the predominant part in a remarkable feat of engineering. In plan view the hovercraft is circular, the wooden peripheral rotor that provides its cushion of air consisting of a $5\frac{1}{2} \times 4\frac{1}{2}$-in. laminated inner circle of Spruce attached to an outer circle of $\frac{1}{2}$-in. plywood. The circular hull is built up from a central cylindrical core, consisting of two 18-in. diam. plywood disks separated by vertical wooden members. The four main ribs radiating from the core are made of $1\frac{1}{4} \times \frac{1}{8}$-in. Spruce spars covered with $\frac{1}{2}$-in. Birch plywood, and around their extremities a $\frac{1}{16}$-in. plywood diaphragm is pinned and glued, forming the circular plan view. The cabin framework is of box beams of Spruce and plywood, with plywood seating and dashboard. The final touches of timber are Mahogany handgrips on the column control wheel, and wooden duckboards. Already test-flown with great success the cushioncraft is now undergoing development tests which, if commercially successful, will lead to its mass production—probably in metal! (**23**; Oct. 1960).

India. The National Forest Policy Resolution of 1952 proposed that the area under forests should be raised steadily to 33% of the total land mass. During the First Five-Year Plan a total area of 75,000 acres was planted, more than 3000 miles of forest roads were built, and more than 20 million acres of private forest were brought under State control, and arrangements made for their proper upkeep. During the Second Plan (now nearing its end), 50,000 acres will have been planted to provide wood for match factories, and 200,000 acres with industrial timbers. Ca. 400,000 acres of derelict forest will also have been rehabilitated, and more than 21,000 sq. miles of forest surveyed. More than 5000 miles of forest roads have been built, and improved logging methods introduced in the Punjab, Himachal Pradesh, and Jammu and Kashmir. During the Third Plan, an area of 2 million acres will be planted with quick-growing trees round the villages to provide fuelwood. Sal and conifer plantations will be

established on 50,000 acres in Uttar Pradesh, the Punjab, Jammu and Kashmir, Himachal Pradesh, and W. Bengal, and Teak plantations on 200,000 acres in Madhya Pradesh, Assam, Kerala, Andhra Pradesh, and Bihar. Fast-growing species will be planted on 450,000 acres in the Punjab, Uttar Pradesh, Rajasthan, Madras, Kerala and other States (**9**; 15.10.60).

Jamaica. A timber-impregnation plant using Tanalith-type preservative has been installed at Kingston. It has an 80 × 6-ft. treatment cylinder for vacuum/pressure impregnation of ca. 1000 cu. ft. of timber in one charge. Experience with imported timber has already shown that termite attack and, to a lesser extent, fungal decay are successfully combated by this preservative. Before the installation of the new plant, impregnated timber was imported from Trinidad and Florida (**12**; April 1960).

Netherlands. Recently a report on mounting boards for museums, exhibitions etc. has been made by the Fibre Research Institute of the T.N.O. at Delft, at the request of the Dutch Museums Association. In the past, little has been known about the precise properties required in this type of board. These were considered under the headings of flatness, colour, opacity, resistance to light, polluted air and micro-organisms, durability, strength, bulk and stiffness. The report makes some recommendations, e.g. that the board should be free from groundwood and be manufactured from good-quality bleached pulp. For this, unused rags and softwood sulphate pulp bleached by the ClO_2 process are acceptable (**11**; 15.10.60).

New Zealand. In June 1959 it was decided to act upon a report that tree seeding in Mexico promised to be exceptionally good. The Silviculturist and the Research Officer in charge of seed collection for the N.Z. Forest Research Institute visited Mexico for 5 months and made a comprehensive collection. In all, 88 seed samples, covering 34 species and totalling 124 lb., were collected from altitudes between 7000 and 10,000 ft. The most promising species appeared to be *Abies religiosa*, *Pinus ayacahuite*, *P. pseudostrobus*, *P. montezumae* and *Cupressus* sp. For each of these, seed lots from various altitudes and localities were collected, to enable provenance trials to be established to find the seed sources most nearly suited to New Zealand conditions. These will be the first provenance trials of Mexican conifers in the world (**13**; 1960).

Norway. Berger Langmoens of Brumunddal are now manufacturing Brunex, a flameproofed insulating board. The board is coated by a special machine which applies a smooth, even coat of Albi-R, a substance that, when exposed to fire, expands and forms a protective barrier shielding the board from surface spread of flame and transmission of heat (**19**; 1.10.60).

Rumania. On 1 July 1960 a Centre for Forest Documentation (CDF) was set up in Bucharest to serve all forest production units and research and educational institutes with information on progress in forestry, wood technology etc. At the same time, the former institutes for research in silviculture (ICF) and wood technology and industrialization have been merged in a new Forest Research Institute (INCEF) (**3**; 15.10.60).

Seychelles. The Coconut Palm is a universal provider for Seychelles Islanders, supplying them with food, drink, housing, fuel and money. Apart from its domestic uses, Coconut (in the form of copra) accounts for 70% of the colony's exports. Great concern is therefore felt at the spread of damage to the Palms by the borer *Melittomma* [*insulare*], and the Government has made a grant of £48,000 to cover their treatment on the island of Mahé. An effective procedure has been devised, which consists in gouging out the decayed tissue around the larval tunnels, through an opening kept as narrow as possible, and treating the exposed wood with a mixture of creosote and coal tar. Within half an hour of painting, the larvae can be seen hanging tail-first out of the tunnels, dead. Eradication on private estates is offered free of all charge. On the island of Praslin, already treated, the outbreak has been controlled (**12**; Sept. 1960).

Thailand. A new forestry Act has been passed with a view to securing improvements in forest management. An order has also been made for the establishment of a Forest Police Division of some thousand officers and men to protect the forests against illicit felling. A new game law has also been enacted for the conservation of wild life (**5**; 30.9.60).

It is expected that by the end of 1961 a new pulp and paper mill utilizing mainly rice straw, will be completed at Ayuthya ca. 80 km. from Bangkok. It is also planned to modernize and expand the existing mill at Kanchanaburi, which uses mainly Bamboo as raw material (**5**; 30.9.60).

A timber-grading course was opened in June 1960 at Bangkok, under the auspices of the Board of Trade and the Sawmill Association of Thailand. The 3-month course, attended by 35 trainees, is the result of recent legislation to improve quality and exercise stricter control of grades of all export commodities. FAO timber-grading rules are being used as textbooks (**5**; 30.9.60).

U.S.A. Preliminary tests carried out on the experimental farm of the Carbide Union in North Carolina have demonstrated a remarkable increase in the rate of growth of trees that were surrounded by a ground cover of polythene film. The % increase ranged from 45 for Robinia to 575 for Ash among the ornamental species tested, and 55–102 for Apple trees. The polythene keeps the soil moist and prevents the growth of competitive weeds, prevents excessively low soil temperatures in winter and high ones in summer, and reduces the leaching of fertilizers by rain or irrigation. The experiments, which began in winter 1957–58 are continuing (**15**; Aug./Sept. 1960).

The Oregon State Forestry Department is experimenting with mobile equipment for forecasting fire weather, which was used in summer 1960 for the first time on a going fire. This initial test, conducted on the fire line of a 12-mile creek fire, was said to constitute the best local fire-weather forecasting yet made. The most important feature of the equipment is mobile facsimile and teletype machines that receive their signals by radio rather than wire transmission. Another innovation important for the success of the operation was the compact, portable weather stations designed to be placed at strategic points adjacent to the going fire (**7**; Sept. 1960).

Important field tests in forest fire control using highly promising viscous fire retardants are being made in southern California. Alginic acid, a substance derived from seaweed, is used as an additive to water, which it thickens into a viscous jelly without appreciably increasing its weight. Its use is well adapted to existing equipment, since it is not any more abrasive or corrosive to pumps than plain water. The primary quality of alginated water is its ability to hold large amounts of water in a continuous film on the surface of forest fuels. Upon drying, the material forms a continuous, tough film, which apparently seals off combustible fuels from the oxygen of the air, thereby preventing rekindling and smouldering. Costs for 0·4 or 0·6% concentrations are ca. $0.03 to $0.05 per gallon of mixture. The addition of a small amount of $CaCl_2$ to the alginated water (1 gal./300 gal.) produces further thickening, and the Ca alginate gel so produced is being tested for aerial application. Alginated water plus di-ammonium phosphate (DAP) has the further advantage of retaining its fire-retardant quality for an indefinite time, until it is washed off by rain (**7**; Nov. 1960).

Public and private forestry forces mustered their full strength to fight the wave of forest fires that ravaged western [U.S.] forest land in July. The fires, most of them caused by lightning, were called by some 'the worst in a century'. On several successive days 25,000 fire fighters were combating 1200 fires. The new techniques of aerial attack by helicopters and air tankers proved effective in the control operations. Hundreds of fire-jumpers worked on a round-the-clock schedule, and 319 aircraft were employed. This disastrous fire situation was the result of a prolonged period of hot, dry weather with no rain, followed by heavy concentrations of dry lightning storms (**1**; Sept. 1960).

The common Spanish moss (*Tillandsia usneoides*) is rapidly becoming a pest to Pecan growers in the southern coastal areas, especially where Pecans are growing near Live Oaks [*Quercus virginiana*]. The moss is not parasitic, but large accumulations are detrimental to tree vigour and growth because of the shading effect. Effective control was obtained by experimental annual spraying of moderately infested trees with 10 lb. $CuSO_4$+10 lb. Ca arsenate in 100 gal. water, applied in Feb. or March when the trees were dormant. At the end of 3 years the moss was practically eliminated (**2**; 15.9.60).

The European Pine shoot moth [*Rhyacionia buoliana*] has been found in an Oregon nursery. It was first reported in the western part of the U.S.A. in 1959 in the Seattle area. It is believed to have been introduced on *Pinus sylvestris* scions and so far has only occurred on nursery stock of ornamental trees, but in view of the potential danger to native Ponderosa and Lodgepole Pine stands, active measures are being taken to eradicate it at once (**7**; Oct. 1960).

The Tennessee Valley Authority has started a forest inventory of the entire Tennessee River watershed. Five foresters have been assigned to the project, which involves collecting data on about 300 $\frac{1}{5}$-acre forest plots and about the same number of non-forest plots. Two previous inventories have been made, in 1940 and 1950 (**10**; Sept. 1960).

An eleven-state survey conducted by the Southern Pulpwood Conservation Association, Atlanta, Georgia, shows that pulp and paper companies and independent suppliers of pulpwood in 1959–60 were responsible for planting on their own lands and distributing to other private landowners 401 million seedlings. Over 58% of these tree seedlings were produced in 19 industry-operated nurseries in the South (**10**; Oct. 1960).

School children from the schools of Portland, Oregon, have planted over half a million trees on the Tillamook Burn in the past ten years, as part of a broad programme for education in conservation. Some 9800 children have participated, and have learnt to appreciate the importance of the forests to the state, and the urgency of protecting them. High-school participation in the Tillamook Burn reforestation project ended abruptly in 1958, the year of the Sputnik. After the Russians launched the first satellite, schools and science education were criticized throughout the nation. Changes were made in curricula and 'off campus' activities, and in Portland almost all 'off-campus' activities were eliminated with the exception of athletics. High schools have neither planted trees nor provided leaders to grade-school planting parties since that time (**1**; Sept. 1960).

Permanent, inexpensive storage containers for increment cores can now be obtained commercially from the manufacturer, the Celluplastic Corporation, 55 North Street, Fitchburg, Mass. Tubes of clear, butyrate plastic in various diameters with matching waterproof plugs are available for every size of core currently used by foresters. The plastic tubes, which are supplied in 18 in. lengths, can be cut to any desired length with household scissors. They eliminate the necessity for having both temporary and permanent containers, since they are completely acceptable for either purpose. By frosting one end with fine sandpaper, they can be marked permanently with Indian ink. Letters or numbers on a slip of paper inside the clear tube can be easily read through the plastic. Matching neoprene plugs render the tubes watertight. This makes them useful for bringing specific-gravity cores from the field to laboratory without loss of moisture (**10**; Oct. 1960).

A new method of loading and bracing treated poles and piling for transport on flat-topped railway wagons has been developed by the Signode Steel Strapping Co., Ill. It consists essentially of binding standardized bundles of poles with steel straps so that the top layer of poles of one bundle is also strapped into, and forms the bottom layer of, the bundle above, thereby interlocking each bundle. As the load 'settles' in transit, it presses on the straps, thus maintaining their tension, and any buckling of the load, with its consequent strain on the upright supports, is avoided. After a development period of 20 months, the method, with its various specifications for different heights and loads, was approved in March 1960 by a Special Committee on Forest Products Loading of the Association of American Railroads (**22**; July 1960).

An International Friendship Grove has been planted on the campus parkway of the University of Washington, to commemorate the Fifth World Forestry Congress. Sixty-six different species of trees, each symbolic of one of the nations attending the Congress, were planted in the grove, which is dedicated to eternal peace among nations (**2**; 1 Oct. 1960).

A new Forest Service Laboratory has been inaugurated at Gulfport, Mississippi, to house 3 units of the Southern Forest Experiment Station—the Southern Institute of Forest Genetics, the Forest-Disease Laboratory, and the Forest Insect Laboratory (**16**; 1.9.60).